Natural Construct

Administration and Modeling User's Manual

SOFTWARE AG

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This document applies to Natural Construct Version 4.4 and to all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

Readers’ comments are welcomed. Comments may be addressed to the Documentation Department at the address below.

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TABLE OF CONTENTS

5. NEW MODEL EXAMPLE

20. EXTERNAL OBJECTS

22. USING SYSERR REFERENCES FOR MULTILINGUAL SUPPORT

PREFACE

This preface explains how information is presented for different platforms, as well as the purpose and structure of the *Natural Construct Administration and Modeling User's Manual*. It includes information about other resources you can use to learn more about Natural Construct.

The following topics are covered:

Mainframe and Unix Platforms

The majority of the information in this manual applies to all supported platforms. When differences in operation exist for different platforms, the following methods are used to explain them:

- When a description applies to only one supported platform, the platform is indicated in parentheses. For example: (mainframe) or (Unix).
- When a minor difference exists, it is explained in parentheses. For example: “Enter CSTG at the Next prompt (in the Direct command box on Unix).”
- When a more significant difference exists, a note explains the difference. For example:

Unix Note:
Enter ...

- When major differences exist, separate sections or chapters are devoted to specific platforms. The platform names are displayed in the section or chapter headings. For example: Natural Construct for Mainframe or Natural Construct (Mainframe).

This manual explains how to invoke and use the Administration subsystem of Natural Construct. Its purpose is to help Natural Construct administrators:

- Maintain the existing models, code frames, and Control record for their companies
- Create new models
- Use the utilities provided with Natural Construct

This manual assumes that, as a Natural Construct administrator, you have extensive knowledge of Natural and the Natural Construct Generation subsystem.

Structure of this Manual

The following table describes the information contained in each chapter:'

Chapter	Title	Topics
1	Introduction	Contains a general description of Natural Construct and the basic information you need to use the Administration subsystem.
2	Using the Administration Subsystem	Describes the features and functions of the Administration main menu, in both standard and translation mode, as well as the implementation of security precautions.
3	Using the Code Frame Editor	Describes the fields and features of the Code Frame editor, as well as the line and edit commands you can use in the editor.
4	Creating New Models	Describes the procedure for creating a new Natural Construct model.
5	New Model Example	Contains an example of how to create a new model following the steps in Chapter 4.
6-17	CST* Models	Describes the models that generate the parameter data areas (PDAs) and model subprograms for your models. These chapters include examples.
18	User Exits	Describes the user exits for the Natural Construct generation models and how you can insert these user exits in a Natural Construct-generated module.
19	Modifying the Supplied Models	Describes how to modify models supplied with Natural Construct.
20	External Objects	Describes the subprograms and helproutines supplied with Natural Construct.

Chapter	Title	Topics (continued)
21	Utilities	Describes the utilities supplied with Natural Construct for all supported platforms.
22	Using SYSERR References for Multilingual Support	Describes how to use the SYSERR utility to provide multilingual support. You can use SYSERR message numbers to reference text strings in different languages.
Appendix	Appendix	Contains a glossary of terms used throughout this manual.

Other Resources

This section provides information about other resources you can use to learn more about Natural Construct. For information about these documents and courses, contact the nearest Software AG office or visit the Software AG website at www.softwareag.com to order documents or view course schedules and locations. You can also use the website to email questions to Customer Support.

Related Documentation

This section lists other manuals and guides in the Natural Construct manual set.

User Manuals

For information about using Natural Construct, see:

- *Natural Construct Generation User's Manual*
  This manual is intended for developers who create applications using the supplied models.
- *Natural Construct Help Text User's Manual*
  This manual is intended for developers who create and maintain help text for Natural Construct-generated applications, as well as for developers who create and maintain help text for user-written models.
- *Natural Construct Getting Started Guide*
  This guide provides a quick overview of Natural Construct and its many features and capabilities. It is intended for programmers who are new to Natural Construct.

Installation Manuals

For information about installing Natural Construct, see the installation manual for your platform.

Other Documentation

This section lists documents published by WH&O International:

- *Natural Construct Tips & Techniques*
  This book provides a reference of tips and techniques for developing and supporting Natural Construct applications.
- *Natural Construct Application Development User's Guide*
  This guide describes the basics of generating Natural Construct modules using the supplied models.
- *Natural Construct Study Guide*
  This guide is intended for programmers who have never used Natural Construct.

Related Courses

In addition to the documentation, the following courses are available from Software AG:

- A self-study course on Natural Construct fundamentals
- An instructor-led course on building applications with Natural Construct
- An instructor-led course on modifying the existing Natural Construct models or creating your own models

INTRODUCTION TO NATURAL CONSTRUCT

This chapter introduces Natural Construct and describes how to invoke subsystems and use PF-keys and online help. It includes sections on translating to upper case, handling messages, storing saved modules, and using direct commands.

The following topics are covered:

Description of Natural Construct

Natural Construct is a set of tools for application developers. Created for Software AG's Natural/Predict environment, Natural Construct assists Natural application developers achieve higher productivity goals than are obtainable using Natural and Predict alone. At the same time, Natural Construct helps you standardize and control the application development process.

Natural Construct models offer the following advantages over modules created in Natural alone:

Advantages	**Benefits**
Standardization and quality	Create a consistent user interface and code structure.
Reusage	Once your model is tested and debugged, it can be used by multiple users, problem free. Models help share your Natural expertise, making optimal use of available talent.
Productivity	The benefits include: • Reduce design considerations • Speed up implementation • Reduce testing requirements
Minimize errors	Avoid errors that are introduced by program cloning.

Natural Construct Subsystems

Natural Construct consists of the following subsystems:

Subsystem	Description
Administration	Used by the Natural Construct administrator to define custom models and maintain the models Natural Construct uses to generate programs. The Administration subsystem is described in detail in this manual.
Generation	Used by the developer to define specifications for the Natural Construct models and generate the following modules: • programs • subprograms • helproutines • subroutines • copycode • maps • parameter data areas • local data areas • global data areas • Predict program descriptions • code blocks • JCL text (mainframe) • User exit code For information about this subsystem, refer to *Natural Construct Generation User's Manual*.
Help Text	Used by documentors or developers to create and maintain help text at the map and/or input field level. For more information about this subsystem, refer to *Natural Construct Help Text User's Manual*.

Invoking Natural Construct

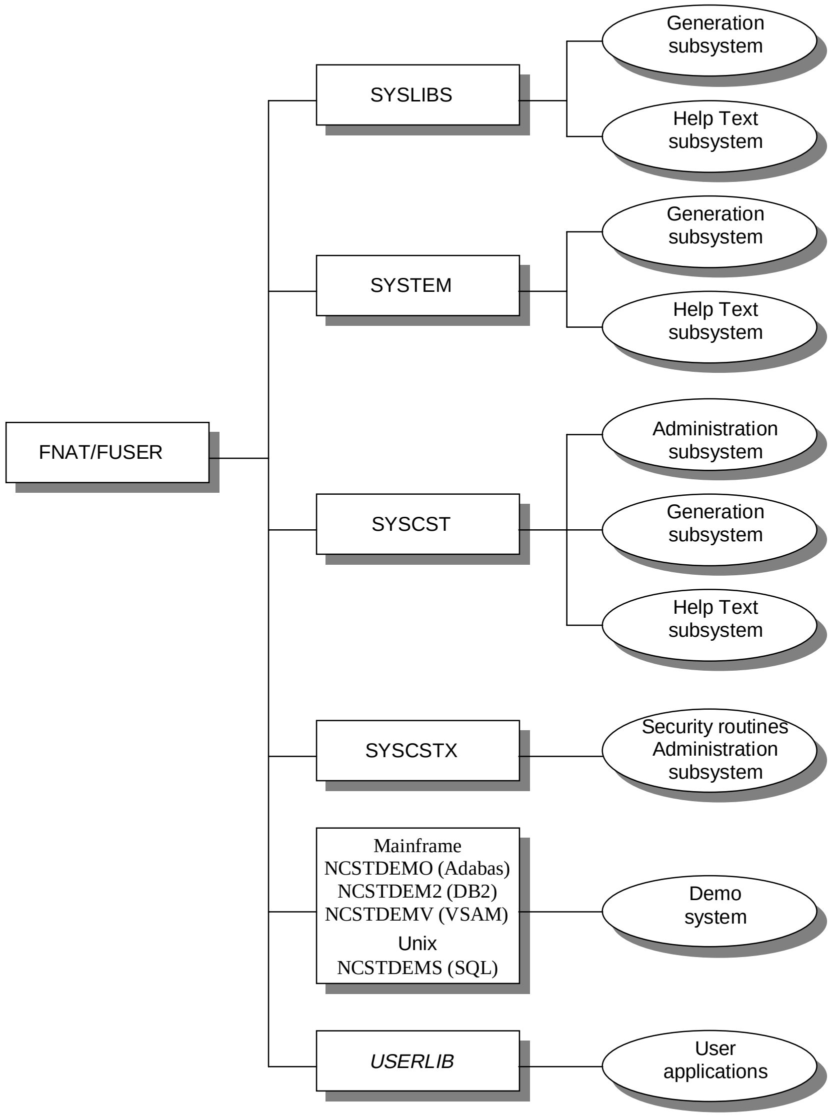
You can invoke the Administration subsystem in standard or translation mode, which allows you to create multilingual specification panels for developers, as well as dynamically maintain the components of Natural Construct panels.

The following sections describe how to invoke each Natural Construct subsystem, how to invoke the Administration subsystem in standard and translation mode, and how to invoke the generation facilities from a steplib with Natural Security installed.

Note: Always terminate Natural Construct by pressing the quit PF-key or entering a period (.) in the input field on the Generation main menu. This method ensures proper cleanup of the environment.

Natural Construct Libraries

Copies of Natural Construct are stored in the libraries shown on the following page.



Natural Construct Libraries

Each library is available to different users and contains different subsystems. The libraries are described in the following sections.

SYSLIBS Library

The SYSLIBS library contains modules used by Natural Construct. The following table indicates who can use the library, the subsystems it contains, and the command used to invoke each subsystem:

Users	Subsystems	Enter at the Next prompt:
All users	Generation	ncstg
	Help Text	ncsth

SYSTEM (FNAT) Library

The SYSTEM library contains modules used by Natural Construct-generated applications. The following table indicates who can use the library, the subsystems it contains, and the command used to invoke each subsystem:

Users	Subsystems	Enter at the Next prompt:
All users	Generation	ncstg
	Help Text	ncsth

SYSCST Library

The SYSCST library is used to modify the supplied models or create new ones. The following table indicates who can use the library, the subsystems it contains, and the command used to invoke each subsystem:

Users	Subsystems	Enter at the Next prompt:
Administrators	Administration	menu (standard mode) or menut (translation mode)
	Generation	cstg
	Help Text	csth

SYSCSTX Library

The SYSCSTX library contains sample security routines provided with Natural Construct. It is used by administrators.

The security routines can be used as is or modified as desired. To make the routines active, they must be moved to the SYSCST library.

NCSTDEMO, NCSTDEM2, NCSTDEMV, and NCSTDEMS Libraries

These libraries contain the Natural Construct demo system for different systems. To invoke the demo system, enter “menu” at the Next prompt in the applicable library.

USERLIB Library

This library is created by Natural Construct users.

Executing Generation Facilities from a Steplib with Natural Security Installed

With Natural Security installed, you can invoke the Natural Construct generation facilities from a steplib. This allows you to override the supplied model subprograms at a higher level steplib without disturbing the modules supplied by Natural Construct.

For example, you can define the following steplibs in your development library:

- CSTMODS (your modification library)
- SYSCST
- SYSLIBS
- SYSTEM

Using this configuration, you can easily change your standards without disturbing the supplied modules. To modify any modules in the SYSCST or SYSTEM library that are affected by changes, copy them into the CSTMODS library.

Note: You can also define multiple modification libraries in the steplib chain (to reflect corporate versus application standards).

When you invoke Natural Construct from a steplib, the highest level steplib should contain a replacement for the NCSTG program, such as:

```
FETCH 'CSTG'
END
```

Otherwise, the NCSTG program invokes the version of Natural Construct stored in the SYSLIBS library.

Note: If Natural Security is not installed, see USR1025P in the SYSEXT library for an example of how to set up your steplibs.

Using Natural Construct PF-Keys

In Natural Construct, certain PF-keys have standard functions (pressing the PF1 key invokes online help, for example). The PF-key lines, which are located at the bottom of most panels, display the PF-key functions for that panel.

PF-keys 13 to 24 are equivalent to PF-keys 1 to 12, respectively. However, only PF1 to PF12 are displayed.

Note: You can change the function and/or description associated with each key (for more information, see the **Administration Main Menu, page 46)**. Within this manual, we refer to the standard default values.

By default, the standard PF-keys and functions are:

PF-Key	Name	Function
PF1	help	Displays help for a particular panel or field. When the cursor is in a field followed by an asterisk (*), pressing PF1 displays a window from which you can select a valid value for the field. For information, see **Field-Level Help**, page 39. When the cursor is not in a field followed by an asterisk (*), pressing PF1 displays a table of contents from which you can select a topic. For information, see **Panel-Level Help**, page 37. **Note:** An asterisk is the default help indicator for Natural Construct. The help indicator for your organization may be different.
PF2	retrn	Displays the previous panel. Pressing PF2 is equivalent to entering a period (.) in the Code field on a menu.

PF-Key	Name	Function (continued)
PF3	quit	Terminates the Natural Construct session. In most cases, a confirmation window is displayed when you press PF3. Press PF3 again to complete the termination process and return to Natural.
PF7	bkwrd	Scrolls backward (up) through data.
PF8	frwrd	Scrolls forward (down) through data.
PF10	left	Displays the panel to the left of the current panel. If you are currently on the first panel in a series of panels, pressing PF10 displays the last panel in the series.
PF11	right	Displays the panel to the right of the current panel. If you are currently on the last panel in a series of panels, pressing PF11 displays the first panel in the series.
PF12	main	Displays the Natural Construct Administration main menu.

Help and Return Codes on Menus

On each Natural Construct menu, you are given the options "?" and "." as valid menu codes. Typing a question mark (?) in the Function field and pressing Enter displays help for that panel. It is equivalent to pressing PF1 (help). Typing a period (.) and pressing Enter terminates the current program and returns you to the previous menu. It is equivalent to pressing PF2 (retrn).

Natural Construct Online Help

Natural Construct provides extensive online help. You can display both general help information for each panel (panel-level help) or help for a specific field (field-level help). Natural Construct online help is described in the following sections.

Panel-Level Help

While you are using Natural Construct, you can display help information about the current panel by moving the cursor anywhere on the panel (except an input field) and pressing PF1 (help).

Note: If the cursor is in an input field when you request help, Natural Construct displays help information for that field. For more information, see **Field-Level Help**, page 39.

The following example shows the panel-level help window for the Administration main menu:

```
                              Panel Help
                       Administration Main Menu

 This menu lists the functions available within the Administration
 subsystem; you use these functions to perform various administrative
 duties within Construct.

 For translation mode details, see:
  <<Administration Main Menu>>

 For example, you use these functions to:
 - maintain the Construct Control record defaults, such as the
   default PF-key settings and dynamic attribute characters
 - maintain the Construct components, such as the code frames and
   subprograms used by each model
 - invoke the supplied utilities to compare models or code frames
 - use the supplied driver programs to invoke many of the internal
   Construct subprograms
 Page ... : 1  / 2
 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF1
 frwrd help  retrn quit                    bkwrd frwrd
 Help for: P/CS/CSDMNM0/1
```

Panel-Level Help for the Administration Main Menu — Page 1

You can use the following actions to move through the help windows:

- To scroll forward through the pages of help text, either enter a number in the Page field, press PF8 (frwrd), or press Enter.
- To scroll backward, either enter a number in the Page field or press PF7 (bkwrd).
- To return to the main screen, press PF2 (retrn).
- To display help about how to use online help, press PF1 (help) in any help window.
- To display information about a topic enclosed within angle brackets (<< >>), move the cursor over the name and press Enter. A window is displayed, containing help information about the selected topic.

Field-Level Help

Natural Construct has two types of field-level help: passive and active. Passive field-level help displays a description of a field on a panel. Active field-level help displays a selection window containing the valid values for a field. If active help is available, the field is followed by an asterisk (*).

Passive

➢ To display passive field-level help, either:

1 Move the cursor to any field that is not followed by an asterisk (*).

2 Press PF1 (help).

or

1 Type a question mark (?) in the first-character position of any field that is not followed by an asterisk (*).

2 Press Enter (mainframe).

Active

➢ To display active field-level help, either:

1. Move the cursor to a field followed by an *.
2. Press PF1 (help).

or

1. Type "?" in the first-character position of a field followed by an *.
2. Press Enter (mainframe).

The following example shows the help window for the Relationship name field:

```
CPHRL            Natural Construct             CPHRL0
Aug 20        Select Predict Relationship       1 of 1

Relationship                     Relationship type
------------------------------- -----------------------
NCST-CUSTOMER-ORDER-HEADER        Natural Construct
NCST-LINE-HAS-DISTRIBUTION        Natural Construct
NCST-ORDER-HAS-LINES              Natural Construct
NCST-POLICY-COVERS-VEHICLES       Natural Construct
NCST-POLICY-HAS-INQUIRIES         Natural Construct
NCST-POLICY-IS-FOR-CUSTOMER       Natural Construct
NCST-PRODUCT-ORDER-LINES          Natural Construct
NCST-VEHICLES-HAVE-COVERAGES      Natural Construct
NCST-VEHICLES-MUST-EXIST          Natural Construct
NCST-WAREHOUSE-CUSTOMER           Natural Construct
Relationship  .......... ________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9-
      help  retrn                         bkwrd frwrd
Position cursor or enter screen value to select
```

Active Field-Level Help Window

➢ To select a value from the help window:

1. Move the cursor to the line containing the value.
2. Press Enter.
   You are returned to the original panel and the selected value is displayed in the field for which you requested help.

Automatic Upper Case Translation

Natural Construct automatically performs the commands needed to convert your text from lower or mixed case to upper case where appropriate. Headings are displayed exactly as entered (lower or upper case), but if certain specifications must be in upper case, Natural Construct converts them. When you exit, the case setting is restored to the same value as when Natural Construct was invoked.

Mainframe Note:
You must specify your teleprocessing (TP) monitor's command for lower case. In Com-Plete, for example, issue the LOW command.

Natural Construct Messages

Natural Construct sounds an alarm and displays warning messages for errors. Make sure the alarm on your terminal is set to an audible volume.

Natural Construct also supports multilingual messages for your generated programs. If you use message numbers, the message text for the specified language is retrieved at execution time. If you use message text, the text for the specified language is inserted into the program at generation time.

You can change or add to these messages using the SYSERR utility.

– Messages 8000 to 8200 are stored in the SYSTEM and SYSCST libraries
– Messages 8300 to 8500 are stored in the CSTAPPL library
– Messages 1 to 9999 (error message text) are stored in the CSTMSG library
– Messages 1 to 9999 (screen prompt text) are stored in the CSTLDA library
– Messages 1 to 9999 (text for Actions) are stored in the CSTACT library
– Messages 1 to 9999 (text for PF-keys) are stored in the CSTPFK library

For all REINPUT and INPUT message numbers, you can also use the SYSERR utility to add other languages. Generation and CDUTRANS messages are stored in the CSTAPPL library. For information about defining references, see **Defining SYSERR References**, page 495.

Storing Saved Modules

Any module generated by the default generators and saved by Natural Construct is stored as a Natural 2 structured mode object in the current library. You can edit this module as you would any structured mode Natural object.

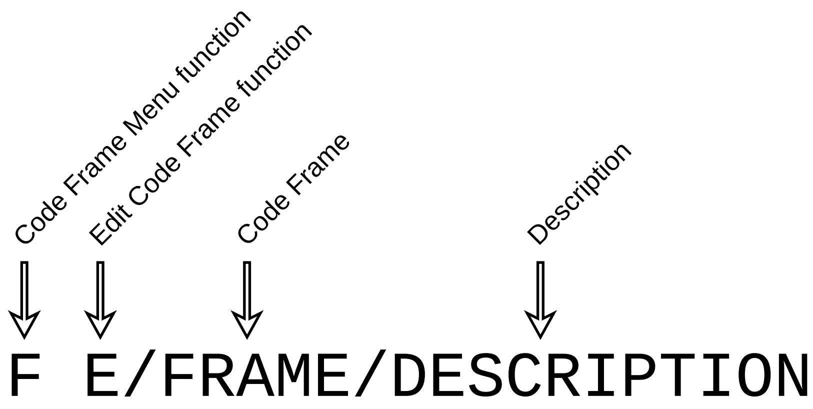
Direct Commands

To navigate within the Administration subsystem, you can enter codes on menus, press PF-keys, or issue direct commands. Direct commands take you to any function or menu within the subsystem without using intervening menus. They are useful for experienced users who know the menu structure, valid menu codes, and the required parameters at each menu level. The following example shows the Command line:

```
Command ___________________________________________________________________
```

You can string together as many commands as you like. If one of the codes is not valid on the corresponding menu, Natural Construct displays that menu so you can enter a valid code.

The following diagram illustrates a sample direct command:



Sample Direct Command

This direct command invokes the Code Frame Menu (menu code F on the Administration main menu) and the Edit Code Frame function (menu code E on the Code Frame menu) and displays the code frame called “FRAME” with the description, “DESCRIPTION”, in the Code Frame editor.

A direct command contains the codes you enter on successive menus. Each direct command must begin with a valid menu code. When entering a direct command, leave a space between menu codes to indicate a new menu or level. To indicate parameters that are at the same level, use a slash (/) to separate them.

Note: The slash (/) is Natural Construct’s default input delimiter. You can change the default delimiter by issuing the GLOBALS ID=new-character command at the Next prompt (Direct command box for Unix) or the Natural command line.

When you enter direct commands on the command line for a menu, Natural Construct first determines whether the code is a valid option on that menu. If no code on the current menu matches the first code in the direct command, Natural Construct checks the main menu for a match.

You can also issue direct commands at the Natural Next prompt (Direct command box for Unix). While you are in the SYSCST library, for example, you can enter:

```
MENU F E/FRAME/DESCRIPTION
```

to invoke the Administration subsystem (MENU) and edit the specified code frame.

USING THE ADMINISTRATION SUBSYSTEM

This chapter describes how to use the Administration subsystem of Natural Construct.

The following topics are covered:

For information about invoking the Administration subsystem, see **Invoking Natural Construct**, page 30.

Administration Main Menu

When you invoke the Administration subsystem, the Administration main menu is displayed:

```
CSDMAIN              N a t u r a l   C o n s t r u c t              CSDMNM0
Oct 04                    Administration Main Menu                   1 of 1

                     Functions
                     -----------------------------------------------
                     M  Maintain Models
                     F  Code Frame Menu
                     S  Maintain Subprograms
                     R  Maintain Control Record
                     C  Compare Menu
                     D  Drivers Menu


                     ?  Help
                     .  Return
                     -----------------------------------------------
Function ........... _



Command ............ ___________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

Administration Main Menu

➢ To perform a function listed on this menu:

1 Type the corresponding one-character function code in the Function field.
2 Press Enter.

The functions available through the Administration main menu are:

Code	Function	Description
M	Maintain Models	Displays the Maintain Models panel. On this panel, you can maintain the components that define a model for the Natural Construct generation process.
F	Code Frame Menu	Displays the Code Frame menu. Using the functions available through this menu, you can maintain the code frames used by the generation models.
S	Maintain Subprograms	Displays the Maintain Subprograms panel. On this panel, you can maintain the modify specification subprograms used by the generation models.
	Note:	To ensure backward compatibility, this option supports models written prior to V3.4.1. that generate subprogram records. Models generated by CST-MODIFY define windows and PF-keys without using the subprogram records.
R	Maintain Control Record	Displays the Maintain Control Record panel. On this panel, you can maintain the default values for the Natural Construct Control record (PF-keys, dynamic attribute characters, help indicator, etc.).
C	Compare Menu	Displays the Compare menu. Using the functions available through this menu, you can compare code frames used by the models.
D	Drivers Menu	Displays the Drivers menu. Using the driver programs available through this menu, you can invoke many of the utility subprograms supplied with Natural Construct. (The source code for these subprograms is not supplied.)

These functions are described in the following sections. For a description of the Help and Return functions, see **Help and Return Codes on Menus**, page 36.

Maintain Models Function

When you invoke the Maintain Models function, the Maintain Models panel is displayed:

```
CSDFM                  N a t u r a l   C o n s t r u c t              CSDFM0
Aug 07                         Maintain Models                        1 of 1

Action .................... __ A,B,C,D,M,N,P,R
Model ..................... BROWSE________________________________
Description ........ *0200.1___________________________________________________
                     BROWSE Program
  PDA name ................ CUSCPDA_     Status window ........... Y
  Programming mode ......... S_         Comment start indicator .. **_
  Type .................... P Program    Comment end indicator .... ___

  Code frame(s) ........... CSCA?___  CSCB?___  CSCC?___  ________  ________
  Modify server specificatn  CUSCMA__  CUSCMB__  CUSCMC__  CUSCMG__  ________
                            ________  ________  ________  ________  ________
  Modify client specificatn  CUSCMA__  CUSCMB__  CUSCMC__  ________  ________
                            ________  ________  ________  ________  ________

  Clear specification ...... CUSCC___     Post-generation .......... CUSCPS__
  Read specification ....... CUSCR___     Save specification ....... CUSCS___
  Pre-generation ........... CUSCPR__     Document specification ... CUS-D___
Command ........... __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit  frame                                             main
```

Maintain Models Panel for the Browse Model

For a description of the actions available through the Action field, press PF1 (help) when the cursor is in the field.

The fields on the Maintain Models panel are:

Field	Description
Model	Name of the model you are maintaining.
Description	Brief description of the model or the SYSERR number that supplies the description. When a module is generated using the specified model, this description is displayed as the first heading on the panel. Because this description is part of the model user interface, you can use SYSERR numbers from the CSTLDA file to support dynamic translation. Within SYSERR, you can also specify substitution variables (instead of hardcoding the message). For example, SYSERR number *0200.1 corresponds to the English text, :1:Program. If you specify *0200.1 in this field for the Browse model, Natural Construct replaces :1: with the model name and the first panel heading becomes Browse Program. (The actual heading is displayed below this field.) For more information about dynamic translation, see **Maintenance**, page 494.
PDA name	Name of the parameter data area (PDA) for the model. This PDA is passed to the model subprograms to capture model specifications. For more information, see **Step 1: Define the Scope of the Model**, page 122.

Field	Description (continued)

Status window	Code that indicates whether the Status window is displayed when a module is generated.
	
	If the code is Y, you can press PF5 (optns) while generating the module to display the Status window, which contains information about the generation progress, save, and/or stow functions. You can also decide how the Status window is displayed. The following example uses symbols:
	
	`<-- PREGEN CUMNGPR`
	`--> FRAME CUMN9`
	`    --> FRAME CU--B9`
	
	The following example uses text:
	
	` Ending Pre-generation Subprogram CUMNGPR`
	`  Starting Code Frame CUMN9`
	`  Starting Code Frame CU--B9`
	
	• To display symbols, enter "Y".
	• To display text, enter "T".
	• If you do not want the window displayed, enter "N".
	
	If this field is blank, it defaults to N.

Programming mode	Mode for the resulting code. Valid codes are S (structured), SD (structured data), or R (reporting) mode. All supplied models use structured mode.
Comment start indicator	Set of characters that indicate the beginning of a comment line for the generated module. As required for Natural modules, the default value is **. You can change this value for other supported programming languages.

Field	Description (continued)
Type	Code for the type of module generated by this model. Valid module types are: • P (program) • E (external; non-Natural) • * (super model modules) • N (subprogram) • S (subroutine) • H (helproutine) • M (map) • L (local data area) • A (parameter data area) • G (global data area) • J (JCL statements; mainframe) • . (statement code block; .g) • T (text) • C (copycode) • blank (determined when a module is generated using this model; model subprograms must assign the CU—PDA.#PDA-OBJECT-TYPE parameter)
Comment end indicator	Set of special characters that indicate the end of a comment. For some programming languages, this set of characters is required to generate modules. For PL1, for example, the indicator is */.
Code frame(s)	Names of the code frames used to create the specified model. The code frames are listed in the sequence they are used during generation. You can specify a maximum of five code frame names for each model; you can only use existing code frames. You can select a code frame and invoke the Code Frame editor from this panel. In the editor, you can also define nested code frames. For more information, see **PF4 (frame)**, page 54.

Field	Description (continued)
Note:	Code frames used to generate maps and data areas can only have subprogram and comment lines.
Modify server specificatn	Names of the subprograms executed when the Modify function is invoked by the Natural Construct nucleus for server platform generation. The subprograms are listed in execution sequence. To change the order of execution, change the order of these subprograms. You can specify a maximum of 10 subprograms.
Modify client specificatn	Names of the subprograms executed when the Modify function is invoked by the nucleus for client platform generation. The subprograms are listed in the sequence they are executed. To change the order of execution, change the order of these subprograms. You can specify a maximum of 10 subprograms.
Clear specification	Name of the subprogram executed when the Clear function is invoked by the nucleus. The Clear function is automatically invoked prior to the Read function or when a new model name is specified and the parameter data area (PDA) is different. It is typically used to set default values for the model.
Post-generation	Name of the subprogram executed when the Post-generation function is invoked by the nucleus. This subprogram applies post-generation changes to the generated program. It is typically used to perform model specification substitutions; it is not supported for models that cannot be regenerated.
Read specification	Name of the subprogram executed when the Read function is invoked by the nucleus. It is typically used to retrieve the specifications from a previously-generated module It is not supported for models that cannot be regenerated.

Field	Description (continued)
Save specification	Name of the subprogram executed when the Save function is invoked by the nucleus (not supported for models that cannot be regenerated). This subprogram is executed immediately after the pre-generation subprogram is executed. It writes the generation specifications so the generated program can be read using the Read function. If a user marks the Save Specification Only option, this subprogram can be invoked even if generation cannot be completed due to specification errors.
Pre-generation	Name of the subprogram executed when the Pre-generation function is invoked by the nucleus. This subprogram sets up internal variables before the generation process begins. It is typically used to set PDAC-variables for code frame manipulation or to generate a module for simple models.
Document specification	Name of the subprogram executed when the Document function is invoked by the nucleus. This subprogram documents generated modules in Predict as they are saved or stowed.

PF4 (frame)

Press PF4 (frame) on the Maintain Models panel to select a code frame for editing. The following example shows the Maintain Models panel for the Browse model:

```
CSDFM                      N a t u r a l   C o n s t r u c t          CSDFM0
Aug 07                          Maintain Models                       1 of 1

Action ..................... __ A,B,C,D,M,N,P,R
Model ...................... BROWSE__________________________
Description ........ *0200.1___________________________________________________
                     BROWSE Program
  PDA name ................. CUSCPDA_     Status window ............ Y
  Programming mode ......... S_           Comment start indicator .. **_
  Type ..................... P Program    Comment end indicator .... ___

  Code frame(s) ............ CSCA?___  CSCB?___  CSCC?___  ________  ________
  Modify server specificatn  CUSCMA__  CUSCMB__  CUSCMC__  CUSCMG__  ________
                             ________  ________  ________  ________  ________
  Modify client specificatn  CUSCMA__  CUSCMB__  CUSCMC__  ________  ________
                             ________  ________  ________  ________  ________

  Clear specification ...... CUSCC___     Post-generation .......... CUSCPS__
  Read specification ....... CUSCR___     Save specification ....... CUSCS___
  Pre-generation ........... CUSCPR__     Document specification ... CUS-D___
Command ............ __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit  frame                                           main
```

Maintain Models Panel for the Browse Model

➢ To select a code frame for editing:

1 Move the cursor over the code frame you want to edit.

2 Press PF4.
The specified code frame is displayed in the Code Frame editor.

Notice that the code frame names listed in the Code frame(s) field end with a question mark (?). All code frames supplied with Natural Construct end with 9. To define a custom code frame for your model, copy the supplied code frame, change the 9 to a lower number (from 1 to 8), and modify the code frame as desired.

The next time Natural Construct calls that code frame, the one with the lowest number is used. For example, you can copy the CSCA9 code frame, change the name to CSCA8, and edit it as desired. The next time Natural Construct calls CS-CA?, CSCA8 is used.

When code frames are referenced in code (nested code frames), their names also end with the question mark character. The question mark indicates a hierarchy in which the code frame with the lowest number at the end of its name is used.

The code frame naming convention is as follows:

- The first character in a code frame name is always C
- The second and third characters are reserved for the two-character model identifiers, such as MN for the Menu model or dash (—) for generic code frames used by multiple models
- The fourth character is a single letter from A-Z indicating a position within a series of code frames
- The fifth, sixth, and seventh characters are optional. They indicate specific functions that are typically performed by nested code frames, such as wildcard support
- The last character must be a number from 1-9, with 9 reserved for the Natural Construct-supplied code frames and 8 reserved for any future updates

Note: The last character refers to the last position in the code frame name, which may or may not be the eighth physical position.

Example of a code frame containing nested code frames

The following example shows the CSLB9 code frame. The code frame referenced from within this code frame (nested code frames) is highlighted:

```
Code Frame ......... CSLB9                                          SIZE 890
Description ........ Browse-Select* model initial setup             FREE 60071
>                                              > + ABS X X-Y _ S 17   L 1
All...+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C
  *
  * Define Formats
  FORMAT KD=ON LS=133 SG=OFF ES=OFF ZP=OFF
  *
  PERFORM INITIALIZATIONS
  *
  PASSWORD-CHECKING                                                        1
  INCLUDE CCPASSW /* Password checking.                                    "
  DIRECT-COMMAND-PROCESSING                                                1
  *                                                                       *
  * Include standard code to check incoming direct command.               *
  INCLUDE CCDCIN  /* Process incoming direct command.                      "
  *
  (HELPROUTINE OR SUBPROGRAM) AND CHECK-WILD-CHARACTER                     1
  PERFORM CHECK-WILD-CHARACTER /* See whether input data contains *, <, >    "
  START-OF-PROGRAM                                                        U
  CSLBA?                                                                  F

  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
```

Example of a Code Frame Containing Nested Code Frames

For more information about modifying the supplied code frames, see **Creating the Code Frame and Defining the Model**, page 193.

Code Frame Menu Function

When you invoke the Code Frame Menu function, the Code Frame menu is displayed:

```
CSMMAIN              N a t u r a l   C o n s t r u c t             CSMMNM0
Aug 07                           Code Frame Menu                        1 of 1

                     Functions
                     -----------------------------------------------
                     E  Edit Code Frame
                     S  Save Code Frame
                     L  List Code Frames
                     P  Purge Code Frame
                     C  Clear Edit Buffer
                     H  Print Saved Code Frame


                     ?  Help
                     .  Return
                     -----------------------------------------------
Function ........... _
Code Frame ......... ________
Description ........ _____________________________________________

Command ............ __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

Code Frame Menu

➢ To perform a function listed on this menu:

1. Type the corresponding one-character function code in the Function field.
2. Press Enter.

   The functions available through this menu are described in the following sections.

Edit Code Frame Function

Use the Code Frame editor to create or modify a code frame. If you do not specify a code frame name in the Code Frame field on the Code Frame menu, the Code Frame editor is empty when it is displayed (see example above). If you enter the name of an existing code frame, Natural Construct reads it into the editor.

```
Code Frame .........                                              SIZE
Description ........                                               FREE 56825
>                                              > + ABS X X-Y _ S      L
  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C















  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
```

Code Frame Editor

To return to the Code Frame menu, enter "." (period) at the > prompt.

The Code Frame editor supports all edit commands except the RUN, CHECK, TEST, STOW, and SAVE command. For more information about the Code Frame editor, see **Using the Code Frame Editor**, page 102.

For more information about modifying the supplied code frames, see **Creating the Code Frame and Defining the Model**, page 193.

Save Code Frame Function

This function saves the code frame currently in the edit buffer to the Natural Construct Code Frame file. If the specified code frame name already exists, the message “Code Frame exists. Press Enter to confirm replace” is displayed. You can either change the name or press Enter to update the existing code frame.

List Code Frames Function

The following example shows the Select Frames window for the List Code Frames function:

```
CSMLIST                   Natural Construct                      CSMLIST0
Oct 07                      Select Frames                          1 of 1

Frame    Description                                 User     Date      Time
-------- ------------------------------------------- -------- --------- ------
C--BAN9  Standard banner                             SAG      Sep 30,01 09:55
CBAA9    Batch define data area                      SAG      Sep 30,01 09:55
CBAB9    Batch initial setup                         SAG      Sep 30,01 09:55
CBAC9    Batch main body                             SAG      Sep 30,01 09:55
CBOA9    Object Browse Subp define data area         SAG      Sep 30,01 09:55
CBOB9    Object Browse Subp main body                SAG      Sep 30,01 09:55
CBRA9    Object Browse Static main body              SAG      Sep 30,01 09:55
CCNA9    Callnat main body                           SAG      Sep 30,01 09:55
CDRA9    Driver main body                            SAG      Sep 30,01 09:55
CETA9    Extendable Input main body                  SAG      Sep 30,01 09:55
CFMA9    Maint define data area                      SAG      Sep 30,01 09:55
 Frame .... ________ Detail ..... _ Scan for ... __________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn                         bkwrd frwrd
Position cursor or enter screen value to select
```

Select Frames Window

The fields in this window are:

Field	Description
Frame	Code frame names in alphabetical order.
Description	Brief description of the corresponding code frame.

Field	Description (continued)
User	User ID code for the user who last saved the corresponding code frame.
Date	Date the corresponding code frame was last saved.
Time	Time the corresponding code frame was last saved.
Frame	To select a code frame, enter the code frame name in this field. (If you enter the name of a code frame that is not currently displayed, the list is repositioned.)
Scan for	If you marked the Detail field, you can also specify a value to scan for. Detail lines are displayed for code frames containing the scanned value only.

Purge Code Frame Function

This function permanently removes a code frame from the Code Frame file.

Note: You cannot purge a code frame if it is currently used in a model.

Clear Edit Buffer Function

This function clears the current values from the Code Frame editor.

Print Saved Code Frame Function

This function prints a hardcopy of a code frame that has been saved.

Mainframe Note:
To use this function, you must have Com-Plete, CMS, TSO, or CICS with Natural/AF or Com-Pose. For more information, see **Frame Hardcopy Utility**, page 486.

Maintain Subprograms Function

When you invoke the Maintain Subprograms function, the Maintain Subprogram panel is displayed:

```
CSDFSP               N a t u r a l   C o n s t r u c t                CSDFSP0
Aug 07                        Maintain Subprograms                      1 of 1

Action ...................... __ A,B,C,D,M,N,P,R
Subprogram .................. ________
Description ........ ____________________________________________________________


PF-keys Used
Backward - Forward ........... _
Test ......................... _

Assign to #PDA-PF-AVAILABLE1 . __________
Assign to #PDA-PF-AVAILABLE2 . __________
Assign to #PDA-PF-AVAILABLE3 . __________

Optional Window Settings
Window height ................ ___
Window width ................. ___

Command .......... ____________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                  main
```

Maintain Subprograms Panel

Use this panel to maintain the PF-key and window settings for the model subprograms. The Natural Construct nucleus uses these settings to determine the window size and PF-key functions for the model maintenance panels and sample subprograms. For a description of the actions available through the Action field, press PF1 (help) when the cursor is in the field.

For more information about dynamic translation, see **Using SYSERR References**, page 496.

Maintain Control Record Function

When you invoke the Maintain Control Record function, the Maintain Control Record panel is displayed:

```
CSCTRL               N a t u r a l   C o n s t r u c t              CSCTRL0
Aug 08              Maintain Control Record                           1 of 1

PF-key Assignments                                         Dynamic Attributes
Main ............. PF 12 NAMED *0031.5___ main              Intensify .......... <
Return ........... PF 2_ NAMED *0031.2___ retrn            Blue ............... _
Quit ............. PF 3_ NAMED *0031.3___ quit              Green .............. _
Test ............. PF 4_ NAMED *0031.4___ test              White .............. _
Backward ......... PF 7_ NAMED *0032.2___ bkwrd            Pink ............... _
Forward .......... PF 8_ NAMED *0032.1___ frwrd            Red ................ _
Move left ........ PF 10 NAMED *0032.3___ left              Turquoise .......... _
Move right ....... PF 11 NAMED *0032.4___ right             Yellow ............. _
Help ............. PF 1_ NAMED *0031.1___ help              Special Hardware
User exit ........ PF 11 NAMED *0032.5___ userX            Blinking ........... _
Help indicator ............... *0033.1___ *                 Italic ............. _
Underscore character ......... *0033.2___ ----              Underline .......... _
Of indicator (eg., 1 of 2) ... *0033.3___ of                Reverse video ...... _
Disable indicator ............ *0033.4___ -
Scroll indicator ............. *0033.5___ >>               Default return ..... >
Position indicator(s) ........ *0034/4___ 1   2   3   4   5   6   7   8   9
                                    ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                  main
```

Maintain Control Record Panel

Use this panel to maintain the default PF-key numbers and names, special characters, and dynamic attribute settings for Natural Construct.

Note: These settings are for Natural Construct only, not for Natural Construct-generated programs.

The fields on the Maintain Control Record panel are:

Field	Description
PF-key Assignments	
PF*n*	PF-key numbers for the corresponding functions. For each function (Main, Return, Quit, Test, etc.), specify the number of the PF-key that performs the function. The PF-key functions are:
Main	Invokes main menu
Return	Displays previous panel
Quit	Terminates current session
Test	Invokes the Test function
Backward	Scrolls backward (up) through data
Forward	Scrolls forward (down) through data
Move left	Scrolls to panel on the left of current panel (previous panel)
Move right	Scrolls to panel on the right of current panel (next panel)
Help	Invokes help for current panel
Note:	Only PF-keys 1 through 12 are defined. PF-keys 13 to 24 are equivalent to PF-keys 1 to 12, respectively.

Field	Description (continued)
NAMED	PF-key names for the corresponding functions or the SYSERR numbers that supply the names. The current names are displayed on the right (main, retrn, quit, etc.). Because PF-key settings are part of the user interface, you can specify a SYSERR number from the CSTLDA file as the PF-key name. For example, SYSERR number *0031.5 corresponds to the English text, “main”. If you specify *0031.5 in one of the NAMED fields, the corresponding PF-key name is “main”.
Help indicator	Character used to indicate that help is available for a panel field (the default is *) or the SYSERR number that supplies the character. The indicator is placed in a separate prompt to the right of the input field.
Underscore character	One- to 4-character set used to create the underscore line for panel text (the default is ----) or the SYSERR number that supplies the character set. The specified set is repeated until all spaces are filled (80, by default). For example, if “----” is specified, the underscore line is displayed as follows: -- Or if “++” is specified, the underscore line is: ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++
Of indicator	Character(s) used to indicate the current panel and the number of additional panels (the default is “of” as in “1 of 2”) or the SYSERR number that supplies the character(s).
Disable indicator	Character used to indicate that an option is unavailable on a panel (the default is -) or the SYSERR number that supplies the character.
Scroll indicator	Character(s) used to indicate that scrolling is available for a field on a panel (the default is >>) or the SYSERR number that supplies the character(s).

Field	Description (continued)
Position indicator(s)	Characters used to indicate a position in a series of positions (the defaults are 1 to 10) or the SYSERR number that supplies the characters. If you are not using SYSERR, change the default characters by typing the new characters on the lines below this field.
Dynamic Attributes	Default dynamic attributes. You can specify up to four attributes, one of which must be the return to normal display attribute (see the description for the Default return field). The attributes are:
Intensify	Character used to intensify text.
Blue	Blue display for color terminals.
Green	Green display for color terminals.
White	White display for color terminals.
Pink	Pink display for color terminals.
Red	Red display for color terminals.
Turquoise	Turquoise display for color terminals.
Yellow	Yellow display for color terminals.
Special Hardware	Options available for terminals with special hardware:
Blinking	Support for blinking option.
Italic	Support for italic option.
Underline	Support for underline option.
Reverse video	Support for reverse video option.

Field	Description (continued)
Note:	Because of hardware restrictions, you may not be able to use all the options listed. For information about each attribute, see the section on the DY session parameter in the *Natural Reference Manual*.
Default return	Character used to return to normal (default) display; the default is >. A character must be specified in this field.

Compare Menu Function

When you invoke the Compare Menu function, the Compare menu is displayed:

```
CSDCMMF              N a t u r a l   C o n s t r u c t              CSDCMMF0
Aug 08                         Compare Menu                           1 of 1

                    Functions
                    ----------------------------------------------
                    M  Compare Models
                    F  Compare Frames







                    ?  Help
                    .  Return
                    ----------------------------------------------
Function .......... _



Command ............... _______________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

Compare Menu

Use the functions available on this menu to compare the definitions for two models or two series of models (using the Compare Models function), or compare two code frames or two series of code frames (using the Compare Frames function).

➢ To select a function from this menu:

1 Type the corresponding one-character function code in the Function field.
2 Press Enter.

The functions available through this menu are described in the following sections.

For a description of the Help and Return functions, see **Help and Return Codes on Menus**, page 36.

Compare Models Function

The following example compares the components of two models or series of models:

```
CSDCMP              N a t u r a l   C o n s t r u c t               CSDCMP10
Aug 08                       Compare Models                            1 of 1



            Old                                 New
Model ...... ________________________________ ________________________________
Database ... 18_                                18_
File ....... 121                                121
Version ....                                    3.4.1










Command ............. ________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

Compare Models Panel

Use this panel to compare code frames, model subprograms, etc., for two models or a series of models. The models can reside in different system files.

Comparing the Components of Two Models in Different Files

➢ To compare the components for two models:

1 Type the name of one model in the first Model field.
2 Type the name of the other model in the second Model field.
3 Press Enter.

Note: The Old and New designation does not limit the comparison to old and new versions of the same model.

The following example compares two models.

```
CSDCMP                N a t u r a l   C o n s t r u c t            CSDCMP10
Apr 22                          Compare Models                       1 of 1
             Old                                  New
Model ...... BROWSE__________________________ BROWSE_________________________
Database ... 18___                             18___
File ....... 121__                             147__
Version .... 3.4.1                             4.2.1
Command ............ __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

The fields on the Compare Models panel are:

Field	Description
Model	Names of the models you want to compare.
Database	Database identification (DBID) numbers for the Natural Construct system file for the specified models (18 in the example above).
File	Natural Construct file numbers for the specified models (121 in the example above).
Version	Natural Construct version numbers for the specified models (3.4.1 in the example above).

Comparing the Components for Two Models in the Same File

➢ To compare the components for two models in the same file:

1 Type the name of one model in the first Model field.

2 Type the name of the other model in the second Model field.

3 Type the DBID number for the Natural Construct system file in the first Database field.

4 Type the Natural Construct file number in the first File field.

5 Press Enter.
The Show Model Differences window is displayed.

Example of comparing two models in the same file

The following example compares the Browse and Browse-Select models in the same file:

```
CSDCMPD                  Natural Construct
Aug 08              Show Model Differences

Old ........ 3.4.1                            New ........ 4.2.1
                    BROWSE                       BROWSE-SELECT
                    ---------------------------- -----------------------
Clear subpr ......  CUSCC                        CUSLC
Pre-generate .....  CUSCPR                       CUSLPR
Post-generate ....  CUSCPS                       CUSLPS
Modify   Host   2   CUSCMB                       CUSLMB
Modify   Host   4   CUSCMG                       CUSLMD
Modify   Host   5                                CUSCMG
Modify   4                                       CUSLMF
Frame .......... 1  CSCA?                        CSLA?
Frame .......... 2  CSCB?                        CSLB?
Frame .......... 3  CSCC?                        CSLC?
Date ............   Jul 31,1901                  Jul 31,1901
Time ............   10:09.510                    10:09.510
User ............   SAG                          SAG
```

Example of Comparing Two Models in the Same File

This window displays the following information:

- Natural Construct version numbers
- Names of the models that are being compared
- Names of the model subprograms used by the models
- Names of the code frames used by the models
- Date the models were created or last saved
- Time the models were created or last saved
- User IDs of the users who created or last saved the models

Compare a Range of Models with the Same Name in Two Files

➢ To compare a range of models with the same name in two different files:

1. Type the starting value for the range in the first Model field.
   The starting value can be the name of a model or the first few characters in the name of a model. You can also limit the range by entering the wildcard character (*) with the model name. For example, if you enter Browse*, all the Browse models are compared.

   For information about using wildcard characters, see **Wildcard Selection**, page 112, in *Natural Construct Generation User's Manual*.
2. Type the DBID number for the first range of models in the first Database field.
3. Type the DBID number for the second range in the second Database field.
4. Type the Natural Construct file number for the first range of models in the first File field.
5. Type the Natural Construct file number for the second range in the second File field.
6. Press Enter.
   The Show Model Differences window is displayed.

Example of comparing models with the same name in two files

The following example compares the Browse model in file 116 (3.3.2 version) to the Browse model in file 120 (3.4.1 version):

```
CSDCMPD                 Natural Construct
Aug 08                Show Model Differences

Old ........ 3.3.2                           New ........ 4.2.1
                   BROWSE                        BROWSE
------------------ ---------------------------- -----------------------
Description ......  BROWSE Program (BR)          *0200.1
Save subpr .......  CUSCGST                       CUSCS
Pre-generate .....  CUSCGPR                       CUSCPR
Post-generate ....  CUSCGPS                       CUSCPS
Document .........  CUSCDOC1                     CUS-D
Modify   1                                        CUSCMA
Modify   2                                        CUSCMB
Modify   3                                        CUSCMC
Frame .......... 1  CUBANNER                     CSCA?
Frame .......... 2  CUSCDA                       CSCB?
Frame .......... 3  CUSCC1                       CSCC?
Frame .......... 4  CUSCC2
Frame .......... 5  CUSCC3
```

Example of Comparing Models with the Same Name in Two Files

Compare Frames Function

The following example shows the Compare Frames panel:

```
CSDCMP                N a t u r a l   C o n s t r u c t              CSDCMP20
Aug 08                          Compare Frames                         1 of 1



             Old                                 New
Model ...... ________________________________ ________________________________
Frame ...... ________                         ________
Database ... 18_                              18_
File ....... 121                              121
Version ....                                  3.4.1







Command ......... ____________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                 main
```

Compare Frames Panel

Use this panel to compare code frames. The models that contain the code frames can reside in different system files.

You can also use the Code Frame Compare utility to compare all code frames for a model and all nested code frames for that model. The results are presented code frame by code frame.

Note: The Old and New designation does not limit the comparison to old and new versions of the same model or code frame.

Compare Two Code Frames

➢ To compare two code frames:

1. Type a code frame name in the first Frame field.
2. Type a code frame name in the second Frame field.
3. Type the DBID for the first code frame in the first Database field.
4. Type the DBID for the second code frame in the second Database field.
5. Type the Natural Construct file number for the first code frame in the first File field.
6. Type the Natural Construct file number for the second code frame in the second File field.
7. Press Enter.
   The Summary Report window is displayed.

Example of comparing two code frames

The following example compares the CUBADA code frame in file 116 (3.3.2 version) to the CBAA9 code frame in file 121 (3.4.1 version):

```
CSDCMPFD                   Natural Construct                      CSDCMP
                             Summary Report


Old version .... 3.3.2               New version .... 3.4.1
      Frame .... CUBADA                    Frame .... CBAA9


 Old    New    Matched    Deleted    Inserted           Comments
------ ------ ---------- ---------- ---------- ----------------------------
  284    292     284          0          8    Frames do not match
Press ENTR to continue or any PF-key to retrn
```

Example of Comparing Two Code Frames

Note: The code frames compared can be different code frames in the same file, the same code frames in different files, or different code frames in different files.

For information about comparing code frames in batch mode, see **Additional Utilities**, page 492.

The Summary Report window displays the following information:

- Version numbers
- Number of lines for each code frame
- Number of lines that match
- Number of lines deleted from the first code frame
- Number of lines inserted in the second code frame
- Whether the code frames match (in this example, they do not match)

For a line-by-line comparison, press Enter:

```
Oct 07                          Natural Construct                       04:15 PM
                                  Compare Frames                         PAGE: 1
  Old version .... 3.3.2                           New version .... 4.2.1

                                   CUBADA/CBAA9                               T C
    --------------------------------------------------------------------- - -
 +  C--BAN?                                                                  F
 =  DEFINE DATA
 =  GDA-SPECIFIED                                                              1
 =            _______________ 33 more equal lines _______________
 =    ET-SPECIFIED                                                             2
 =    01 #HOLD-COUNT(P3)                                                       "
 +    01 #WRITE-LINE(A30)
 =                                                                           *
 =  Secondary file 1 key for ADABAS, VSAM, DB2                              *
 =            _______________ 161 more equal lines _______________
 =    01 #INPUT1                                                               "
 =      KEY-IS-REDEFINED OR KEY-IS-COMPOUND                                   3
 +      02 #INPUT1-FIELDS(&KEY-NAT-FORMAT)                                     "
 +      02 REDEFINE #INPUT1-FIELDS                                             "
 =  CUBAGRED REDEFINE-INPUT-KEY                                               N "
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
frwrd       retrn             top   hcopy       frwrd
```

Code Frame Compare Utility Panel

The lines in the two code frames that match are marked with an equal sign (=). The lines that are in the first code frame, but not the second, are marked with a minus sign (-). The lines that are in the second code frame, but not the first, are marked with a plus sign (+).

- To scroll forward (down) through the information, press Enter or PF8 (frwrd).
- To return to the first line, press PF5 (top).
- To return to the Compare Frames panel, press PF2 (retrn).

Note: After the last page is displayed, you are automatically returned to the Compare Frames panel.

- To print a hardcopy of the Code Frame Compare Utility panel, press PF6 (hcopy).

  For more information about printing a hardcopy of a code frame, see the **Print Saved Code Frame Function**, page 61.

Comparing a Range of Frames with the Same Name in Two Files

➢ To compare a range of code frames with the same name in two different files:

1. Type the starting value for the range in the first Frame field.
   The starting value can be the name of a code frame or the first few characters in the name of a code frame. You can also limit the range by entering the wildcard character (*) with the code frame name. For example, if you enter CFM*, all the code frames that begin with CFM are compared.

   For more information regarding wild cards, see **Wildcard Selection**, page 112, in *Natural Construct Generation User's Manual*.

2. Type the DBID number for the first range of code frames in the first Database field.
3. Type the DBID number for the second range of code frames in the second Database field.
4. Type the Natural Construct file number for the first range of code frames in the first File field.
5. Type the Natural Construct file number for the second range of code frames in the second File field.
6. Press Enter.
   The Frame Compare Facility panel is displayed.

Example of comparing a range of frames with the same name in two files

The following example compares the code frames in file 116 to those in file 121:

```
CSDCMPF                  Natural Construct                         CSDCMF0
Oct 07                     Select Frames                            1 of 1

  Frame             Old                   New
  ----------------- -------------------- --------------------
_ CGMA9             DATE: 01-10-03 09:46 DATE: 01-09-27 15:03
_ CGOA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CGPA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CGRA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CGSA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CHDA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
  CMDA9             Does not Exist       DATE: 01-09-27 15:03
_ CMNA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CN-BAN9           DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CNDA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ CNOA9             DATE: 01-09-30 09:55 DATE: 01-09-27 15:03
_ COBA9             DATE: 01-10-07 11:12 DATE: 01-09-27 15:03
Code frame name .... CFM_____
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF
      help  retrn                         bkwrd frwrd
Position cursor or enter screen value to select
```

Frame Compare Facility Panel

This panel is similar to the Model Compare Facility panel and functions in the same manner. For a description of this panel, see **Compare a Range of Models with the Same Name in Two Files**, page 70.

To display the comparison data for any code frame, enter C in the Selection Column field for that code frame. The Show Model Differences window and then the Code Frame Compare Utility panel are displayed. For a description of the Show Model Differences window and the Code Frame Compare Utility panel, see **Compare Two Code Frames**, page 73.

Comparing All the Frames Used by Two Models

➢ To compare all the code frames used by two models:

1. Type the name of the first model in the first Model field.
2. Type the name of the second model in the second Model field.
3. Type the DBID number for the first model in the first Database field.
4. Type the DBID number for the second model in the second Database field.
5. Type the file number for the first model in the first File field.
6. Type the file number for the second model in the second File field.
7. Press Enter.
   The Show Model Differences window is displayed.

Example of comparing all the frames used by two models

The following example compares the code frames in the Browse model with the code frames in the Browse-Select model:

```
CSDCMPFD                    Natural Construct                     CSDCMPF0
Aug 09                       Summary Report                         1 of 1

Old version .... 3.4.1               New version .... 3.4.1
     Model .... BROWSE                    Model .... BROWSE-SELECT

 Old    New    Matched    Deleted    Inserted             Comments
------ ------ ---------- ---------- ---------- ----------------------------
  576    772     396        180        376    Frames do not match
Press ENTR to continue or any PF-key to retrn
```

Summary Report Window

To display a line-by-line comparison, press Enter. For more information, see **Compare Two Code Frames**, page 73.

Drivers Menu Function

When you invoke the UDrivers Menu function, the Drivers menu is displayed:

```
CTEMENU            N a t u r a l   C o n s t r u c t   4.4.1          CTEMNM0
Oct 31                       Drivers Menu                             1 of 1

                     Functions
                     -----------------------------------------------
                     P  Predict-Related Drivers Menu
                     N  Natural-Related Drivers Menu
                     M  Miscellaneous Drivers Menu








                     ?  Help
                     .  Return
                     -----------------------------------------------
Function ........... __
Command ............ __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                 lang
```

Drivers Menu

Use this menu to access various utility subprograms supplied with Natural Construct. The drivers used to invoke the utilities are grouped according to what kind of subprogram they access. For a description of each menu function and the subprogram it invokes, refer to the applicable **Drivers Menu Option** section in Chapter 20, **External Objects**, page 347.

Multilingual Support for Natural Construct

You can install Natural Construct in static (single) or dynamic (multiple) language mode. If dynamic language mode is installed, you can change your *Language value at runtime and display text in another supported language. You can also add translations for the supplied text or change the supplied text to suit your organization's standards.

Note: For information about installing Natural Construct in static or dynamic language mode, see the *Natural Construct Installation and Operations Manual for Mainframes*.

In dynamic language mode, all text displayed by Natural Construct is supplied from the following libraries in SYSERR:

- CSTLDA, for all panel and window text
- CSTMSG, for all message text

Natural Construct checks the value of the *Language variable to determine what language to display and retrieves the text for that language from the appropriate file.

➢ To add text for another language or modify the supplied text, use one of the following methods:

- Use the SYSERR utility to add translations or modify the supplied text for all Natural Construct screens. Using the SYSERR utility is the quickest way to translate text on all panels.
- Use the Administration subsystem in translation mode to dynamically add translations or modify the supplied text. Typically, you would use translation mode to fine tune translations that were added using the SYSERR utility. This allows you to view the translation in the context of the entire panel.

For more information about SYSERR, see the *Natural Utilities Manual*. For more information about Translation mode, see **PF12 (lang)**, page 81.

Note: To define the text for another language, you must first change the *Language value in the Language Preference window.

PF12 (lang)

To change languages, press PF12 (lang) on the Administration main menu. The Language Preference window is displayed:

```
CSULPS              Natural Construct               CSULPS0
Aug 08             Language Preference                1 of 1

          Number    Languages
        ----------  -----------------------------
            1       English
            2       Deutsch (German)
            3       Francais (French)
            4       Espagnol (Spanish)
            5       Italiano (Italian)
            6       Dutch
            7       Turkish
            8       Danish
            9       Norwegian
            10      Albanian
Number ... __
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---
      help  retrn                         bkwrd frwrd
Position cursor or enter screen value to select
```

Language Preference Window

➢ To select a language currently displayed in this window:

1 Move the cursor to the line containing the desired language.

2 Press Enter.
The main menu is displayed in the selected language.

English (*Language 1) is the default language for Natural Construct. Although other languages are listed in the Language Preference window, you must add the translations for those languages in SYSERR.

If you do not provide translated text for a selected language, Natural Construct determines what language to display based on a user-defined hierarchy of language numbers (defined in the DEFAULT-LANGUAGE field in the CNAMSG local data area). For more information about setting up the language hierarchy, see the *Natural Construct Installation and Operations Manual for Mainframes*.

Administration Main Menu in Translation Mode

To help you maintain the text for Natural Construct panels, windows, and messages, the Administration subsystem is also available in translation mode. In translation mode, you can change the text for all Natural Construct screens. For example, you can create multilingual panels by translating the text to another language or you can modify the text to reflect your organization's standards.

For information about invoking the Administration main menu in translation mode, see **Invoking Natural Construct**, page 30.

The following example shows the Administration main menu in translation mode:

```
CSDMAIN              N a t u r a l   C o n s t r u c t              CSDMNM0
Aug 08                    Administration Main Menu                   1 of 1

                     Functions
                     ----------------------------------------------
                     M  Maintain Models
                     F  Code Frame Menu
                     S  Maintain Subprograms
                     R  Maintain Control Record
                     C  Compare Menu
                     D  Drivers Menu
                     H  Help Text Main Menu
                     G  Generation Main Menu
                     ?  Help
                     .  Return
                     ----------------------------------------------
Function ........... _



Command ..... _________________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                 lang
```

Administration Main Menu in Translation Mode

Notice that functions are available to access the Help Text and Generation main menus in translation mode.

Note: Although the panels look the same in translation mode, they do not perform the same functions. For example, edit checks are not performed on input data. We recommend that you do not use translation mode for maintenance functions (such as defining a new model); use translation mode for translation functions, such as editing text in the current language or creating multilingual specification panels and messages.

The following sections describe how to use translation mode to modify the text on panels, windows, and messages.

Using Translation Mode

Translation mode uses the same series of panels and windows throughout Natural Construct. All translatable text is cursor sensitive. When you select it and press Enter, the Translate Short Message window is displayed. You can identify translatable text by the difference in color or intensification.

Note: If you are using Natural Connection on a PC to access Natural Construct, you can display the Translate Short Message window by double-clicking with the mouse on translatable text.

You can translate two types of text:

- Screen text (text displayed on panels and in windows), which is supplied by the CSTLDA file in SYSERR
- Message text, which is supplied by the CSTMSG file in SYSERR

Each Natural Construct panel or window is associated with a local data area (LDA) that initializes the screen prompt variables. In translation mode, these variables are initialized to a SYSERR number and the actual text values are retrieved at runtime (based on the current value of the Natural *Language system variable).

Note: You can use SYSERR numbers for some or all screen prompts. If you specify text as an initial value, Natural Construct displays the text as entered and the prompt cannot be dynamically translated.

When you use a SYSERR number instead of the actual text, Natural Construct retrieves the corresponding text from the CSTLDA library (for prompts) or the CSTMSG library (for messages) in SYSERR. All changes to the values stored in SYSERR are automatically applied to the panels and messages the next time they are invoked.

Within SYSERR, you can provide text in different languages for each SYSERR number. For even greater reusability, you can use a variable (such as :1:) with the text (for more information, see the **Statements — REINPUT** section in the *Natural Reference Manual*). Typically, the :n: variables are used in messages and the prompt is substituted for the :n: value. The actual text displayed depends on the value of the *Language variable for the user who invoked the panel.

Translation mode allows you to change the text in SYSERR without leaving Natural Construct. You can change the text displayed on the Administration main menu, as well as on panels and help or selection windows for each function available through the Administration main menu. To change screen text in the Generation or Help Text subsystems, invoke the Generation main menu (G function) or Help Text main menu (H function) functions from the Administration main menu in translation mode.

Depending on the current value of *Language, you can either edit the existing text or add the translations for another language. The following sections describe how to perform these tasks.

Editing Text in the Current Language

Using translation mode, you can dynamically edit the text displayed on Natural Construct panels in the current language — without invoking the Natural map or code editor. For example, you can change the field prompt values to match your organization's conventions.

The following example shows the Maintain Models panel (M function) in translation mode:

```
CSDFM                    N a t u r a l   C o n s t r u c t             CSDFM0
Aug 08                           Maintain Models                        1 of 1

Action .................... __ A,B,C,D,M,N,P,R
Model ..................... ________________________________
Description ........ __________________________________________________________

  PDA name ................. ________     Status window ............ _
  Programming mode ......... __           Comment start indicator .. ___
  Type ..................... _            Comment end indicator .... ___

  Code frame(s) ........... ________  ________  ________  ________  ________
  Modify server specificatn  ________  ________  ________  ________  ________
                            ________  ________  ________  ________  ________
  Modify client specificatn  ________  ________  ________  ________  ________
                            ________  ________  ________  ________  ________

  Clear specification ...... ________     Post-generation .......... ________
  Read specification ....... ________     Save specification ....... ________
  Pre-generation ........... ________     Document specification ... ________
Command ........... ___________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit  frame                                              main
```

Maintain Models Panel in Translation Mode

➢ To edit text on the Maintain Models panel:

1 Move the cursor to the prompt text you want to change (not a blank input line).

2 Press Enter.
The Translate Short Message window is displayed:.

```
CSUTLATE                    Natural Construct
Aug 08                   Translate Short Message                    1 of 1

Language Short Message ( CSTLDA1116 )
-------- ....+....1....+....2....+....3....+....4....+....5....+....6....+

English  Action/Subprogram                                             /+26
```

Translate Short Message Window

This window provides quick access to the SYSERR numbers and text.

Any changes you make to the text in this window are automatically applied in SYSERR, so be careful when changing the text for SYSERR numbers that are used on other panels.

Note: The "/+26" value in this window indicates there are up to 26 characters available for each text segment that is to be translated.

To edit text in help or select in windows, invoke the window and edit as described.

Translate Text to Another Language

Use translation mode to add translations for prompt text on Natural Construct panels and windows. For example, you can create specification panels in French (*Language 3).

➢ To translate text to another language:

1 Invoke the Administration main menu in translation mode. For more information, see **Invoking Natural Construct**, page 30.

2 Press PF12 (lang).
The Language Preference window is displayed. For a description of this window, see **PF12 (lang)**, page 81

3 Move the cursor to the line containing the word, "French", and press Enter.
The Administration main menu is displayed.

4 Display the panel you want to translate (in this example, the Maintain Models panel).

5 Put your cursor over the prompt text you want to change (not a blank input line).

6 Press Enter.
The Translate Short Message window is displayed:

```
CSUTLATE                    Natural Construct
Oct 07                    Translate Short Message                   1 of 1

Language Short Message ( CSTLDA1116 )
-------- ....+....1....+....2....+....3....+....4....+....5....+....6....+

English  Action/Subprogram                                           /+30
Francais
```

Translate Short Message Window on the Maintain Models Panel

7 Type the French equivalent under the English text (Action/Subprogram in this example).

Note: The "/+30" value in this window indicates that you can use up to 30 characters for each text segment that is to be translated.

8 Press Enter.
You are returned to the Maintain Models panel and the translated text is displayed.

9 Repeat steps 5 through 8 until all text is translated.

You can translate text on any Natural Construct panel or window by invoking that panel or window and performing the translation procedure (steps 5 through 8).

➢ To translate text on the Browse specification panels. For example, perform steps 1 through 3 on the previous page, and then:

1 Type “G” in the Function field on the Administration main menu.

2 Press Enter.
The Generation main menu is displayed in translation mode.

3 Type “M” in the Function field.

4 Type “Browse” in the Model field.

5 Press Enter.
The first specification panel for the Browse model is displayed.

6 Perform the translation procedure (repeat steps 5 through 8).

User Exit Subprograms to Implement Security

Natural Construct supplies user exit subprograms for the Administration and Help Text subsystems. Use these subprograms to implement security or restrict access to various Natural Construct modules (models, code frames, model subprograms, help text members).

If these subprograms exist in a library within the specified subsystem, Natural Construct invokes the applicable subprogram to enforce security when a user selects a module and action. The subprogram grants or denies access based on the specified user ID privileges. The supplied user exit subprograms are:

Function	Subprogram	Library
Model alias name support	CSXAUEXT	SYSLIBS
Generation main menu (before the post-generation subprogram is invoked)	CSXCNAME	SYSLIBS
User-defined default values for generation	CSXDEFLT	SYSLIBS
Administration main menu	CSXDUEXT	SYSCST
Code Frame menu	CSXFUEXT	SYSCST
Help Text main menu	CSXHUEXT	SYSLIBS
Maintain Model function	CSXMUEXT	SYSCST
Generation main menu (after all substitution values are generated into the program)	CSXPSCHG	SYSLIBS
Maintain Subprograms function	CSXSUEXT	SYSCST

The Natural Construct installation tape contains samples of these user exit subprograms. The sample subprograms are initially loaded into the SYSCSTX library, which is created during installation. To use a user exit subprogram, modify it for your installation and then copy it to the library indicated above.

Note: Keep a backup copy of your modified user exit subprograms.

Defining Default Specifications

You can define default specifications for individual models on an application (library) level — and use these defaults to further automate the generation process.

Note: This functionality does not apply to the statement models or the Object-Maint-PDA and Object-Maint-PDA-R models.

➢ To define default specifications for a model:

1. Type “M” in the Function field on the Generation main menu.
2. Type “DEFAULT” in the Module field.
3. Type the name of the model (for which you want to define defaults) in the Model field.
4. Press Enter to display the first specification panel and define your default specifications.
   Continue defining defaults on the remaining specification panels (if there is more than one) until you are returned to the Generation main menu.
5. Type “S” in the Function field.
6. Press Enter to save your defaults.

➢ To modify previously-defined default specifications for a model:

1. Type “R” in the Function field on the Generation main menu.
2. Type “DEFAULT” in the Module field.
3. Type the name of the model (for which you are modifying defaults) in the Model field.
4. Press Enter.
   Natural Construct reads the specifications for the model.

5 Type "M" in the Function field.

6 Press Enter to display the first specification panel and modify the default specifications.
Continue modifying defaults on the remaining specification panels (if there is more than one) until you are returned to the Generation main menu.

7 Type "S" in the Function field.

8 Press Enter to save your modifications.

Note: While you are defining default parameters, the specification edits are not invoked.

Natural Construct reads the model defaults into the editor when the clear subprogram is invoked for a model. This occurs whenever you invoke the Clear Specification and Editor function while a model name is specified, or invoke the Modify Specifications function for a new model name.

The names of the modules that store the default specifications are derived from the names of the model clear subprograms. For example, if the clear subprogram for the Maint model is CUFMC, the default specifications module is C@FMC.

To maintain unique default specification modules for each model, the supplied Natural Construct models have their own unique clear subprograms.

Note: If you have custom models that share common clear subprograms, you should make copies of the models, ensure that each model has a unique name, and provide a corresponding clear subprogram with a unique name for each one.

Defaults specified at the application level override defaults specified in the PROVIDE-DEFAULT-VALUES user exit for the clear subprogram. That is, if a default specification module exists in the current library for a model, Natural Construct uses these defaults rather than the defaults specified in the user exit. If no default module exists in the current library for a model, Natural Construct uses the defaults specified in the user exit.

On the Generation main menu, the Read Specifications, Modify Specifications, Save Generated Source, List Generated Modules, and Clear Edit Buffer functions support specification defaults. The Invoke User Exit Editor, Generate Source, Test Generated Source, Edit Generated Source, and Stow Generated Source functions do not support default specifications.

You can modify the DEFAULT keyword by changing the value of the DEFAULT-SPECIFICATION-KEYWORD parameter in the CSXDEFLT subprogram. After modifying this value, re-catalog CSXDEFLT and use the SYSMAIN utility to copy the object code into the SYSLIBS library.

Using the CSXDEFLT Subprogram

This method provides default values for model parameters that can be overridden on the model specification panels, as well as internal model parameters the developer cannot change.

The supplied models retrieve many of the default parameter values by issuing a CALLNAT to the CSUDEFLT subprogram. Prior to returning the defaults, CSUDEFLT checks to see whether the values have been overridden by the user-defined CSXDEFLT subprogram. If so, the overridden values are returned to the model.

Normally, the model's clear subprogram requests the default values; the returned values are copied to the model parameter data area (PDA). This way, the overhead of retrieving these defaults is only incurred when the user switches to another model or issues a Clear request.

To simplify the interface to CSUDEFLT, Natural Construct supplies three parameterized copycode members. The copycode member you use depends on the format of the field you are providing defaults for:

Copycode Member	Description
CCDEFLTA	Provides default values for alphanumeric fields.
CCDEFLTL	Provides default values for logical fields.
CCDEFLTN	Provides default values for numeric fields.

Each copycode member accepts two parameters. The format of the second parameter determines which of the copycode members to use:

- The first parameter identifies the default value; this value is passed to CSXDEFLT as the CSADEFLT.PARM-NAME variable.
- The second parameter defines the variable to which the default value is assigned. This variable is assigned the value returned in CSADEFLT.PARM-VALUE.

Example of retrieving an alphanumeric default value

```
/*
/* Assign default date edit mask to (alphanumeric) model PDA variable
INCLUDE CCDEFLTA '''DATE-EDIT-MASK''' 'CUMNPDA.#PDA-DATE-EDIT-MASK'
```

During installation, CSXDEFLT is installed in the SYSCSTX library. For testing purposes, copy CSXDEFLT into the SYSCST library. For production purposes, copy CSXDEFLT into the SYSLIBS library.

For a list of parameters that can be modified by CSXDEFLT, see the CSUGETDF program. CSUGETDF also indicates which parameters are currently being overridden by CSXDEFLT. A description of these parameters is provided in the source code for CSXDEFLT.

Using Library-Specific Defaulting

This method provides default values for model parameters that appear as input fields on the specification panels for a model.

You can provide default parameter values for a model by assigning the default settings within a specified library. This method only applies to parameters supplied through input fields on the specification panels for the model. For information about providing library-specific defaulting, see **Defining Default Specifications**, page 91.

Using CSXCNAME Overrides

This method provides default values for model parameters that can be overridden by changing one source code string to another.

You can globally override defaults for all modules generated by a model by supplying the CSXCNAME user exit subprogram. If present, this subprogram is invoked as part of the post-generation process to apply any CHANGE commands to the generated source code.

To use this method, ensure that the stacked CHANGE string uniquely identifies a string (since the change will apply even if the CHANGE string is embedded in a longer string). To set the first parameter to null, stack the third parameter.

Example of using the CSXCNAME subprogram override

```
STACK TOP DATA FORMATTED 'CCSETKEY' 'MYSETKEY'
STACK TOP DATA FORMATTED '(EM=LLL MM DD)' ' ' 'X' /* Set to null
END
```

Assigning Corporate Defaults

You can define default values at the corporate level. For example, you can use the export data function to default information such as the export work file number and the delimiter character. To implement the defaulting mechanism, see the following code example. The example illustrates how a work file number and column delimiter values are defaulted.

Example of assigning corporate defaults

```
** We want to default two internal variables: #WORKFILE-NR and
** #COLUMN-DELIMITER
   DEFINE DATA
     LOCAL USING CSADEFLT              /* Must include user default
                                      /* interface LDA
     LOCAL
     01 #WORKFILE-NR(N2) INIT<5>       /* Assign fallback default "5"
     01 #COLUMN-DELIMITER(A1) INIT<','>/* Assign fallback default ","
     01 #PERFORMANCE(L) INIT<FALSE>    /* Assign fallback default
                                      /* "FALSE"
   END-DEFINE
** Assign corporate default overrides if available
   INCLUDE CCDEFLTN '''WORKFILE-NUMBER-PC-DOWN''' #WORKFILE-NR
   INCLUDE CCDEFLTA '''WORKFILE-DELIMITER-CHAR''' #COLUMN-DELIMITER
   INCLUDE CCDEFLTL '''PERFORMANCE''' #PERFORMANCE
** Note that there are 3 separate INCLUDE members: one for numeric
** defaults (CCDEFLTN), one for alphanumeric defaults (CCDEFLTA), and
** one for logical defaults (CCDEFLTL)
** Continue normal processing and the initial values may have been
** overridden by a corporate-supplied defaulting routine.
```

Note: To apply the changes corporation-wide, you must add the initial variable name and its initial value in the CSXDEFLT user exit subprogram.

Note: The internal defaulting mechanism may be affected when you use this defaulting mechanism to initialize the specification panel default keyword. Use the same keyword for both mechanisms. The specification panel default keyword overrides the internal default keyword.

Using Predict Keywords

You can use Predict keywords to define default values for some model input parameters (for example, primary key fields, logical hold fields, and object descriptions). If default values have been specified in Predict, Natural Construct fills in the default values when the model is invoked. This reduces the number of specifications developers must provide when using the model.

Defining a Default Primary Key

You can define a default value for a primary key by specifying a descriptor name in the Sequence field for the file in Predict. Natural Construct observes the following priorities when defaulting a primary key name for a file:

1. If the value of the default Sequence field for the file is unique and a valid descriptor, Natural Construct uses this value as the primary key.
2. If the value of the default Sequence field is not unique, Natural Construct reads through the file and uses a unique descriptor field value as the primary key.
3. If the file does not have a unique descriptor field, but has only one descriptor field, Natural Construct assumes the field value is unique and uses it as the primary key.

Defining a Default Logical Hold Field

You can define a default value for the logical hold field by attaching a keyword called “HOLD-FIELD” to the field in Predict. (You may have to first define the HOLD-FIELD keyword in Predict using Keyword Maintenance.)

Natural Construct observes the following priorities when defaulting a hold field name for a file:

1. If the HOLD-FIELD keyword is attached to a field that meets the format criteria for a hold field, Natural Construct uses this field as the logical hold field.
2. If a field name contains any of the following strings:

- HOLDFIELD
- HOLD-FIELD
- HOLD_FIELD
- TIMESTAMP
- TIME-STAMP
- TIME_STAMP
- LOGCOUNTER
- LOG-COUNTER
- LOG_COUNTER

3. If the field meets the format criteria for a hold field, Natural Construct uses this field as the logical hold field.

Defining a Default Object Description

You can define a default value for the object description by specifying the default value in the Literal Name field for the file in Predict. Natural Construct uses this value as the object description when the file is referenced in messages. If the value is “Customer”, for example, messages are displayed as “Customer not found” or “Customer displayed”.

USING THE CODE FRAME EDITOR

This chapter describes the purpose and functions of the Code Frame editor. A code frame is the basic building block of a model. It provides a rudimentary outline of the code generated by the model. Code frames may contain condition codes to generate blocks of code conditionally. They may also contain subprograms used to generate more complex blocks of code.

This chapter describes how to invoke the Code Frame editor and the command execution order. It also describes applicable line and edit commands and how to recover edits if your session is interrupted.

The following topics are covered:

Invoking the Code Frame Editor

➤ To invoke the Code Frame editor from the Administration main menu:

1 Type "F" (Code Frame Menu function) in the Function field.

2 Press Enter.
The Code Frame menu is displayed:

```
 CSMMAIN              N a t u r a l   C o n s t r u c t              CSMMNM0
 Jun 20                       Code Frame Menu                         1 of 1

                     Functions
                     ----------------------------------------------
                     E  Edit Code Frame
                     S  Save Code Frame
                     L  List Code Frames
                     P  Purge Code Frame
                     C  Clear Edit Buffer
                     H  Print Saved Code Frame


                     ?  Help
                     .  Return
                     ----------------------------------------------
 Function ........... _
 Code Frame ......... ________
 Description ........ ____________________________________________

 Command ............ _________________________________________________________
 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
       help  retrn quit                                                 main
```

Code Frame Menu

3 Type "E" in the Function field on the Code Frame menu.

4 Press Enter.
The Code Frame editor is displayed:

```
Code Frame .........                                           SIZE
Description ........                                           FREE 61361
>                                            > + ABS X X-Y _ S    L
  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C





















  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
```

Code Frame Editor

You can also invoke the Code Frame editor from the:

- Command line, by entering “E” and the code frame name separated by a slash (/)
- Maintain Models panel, by selecting a code frame and pressing PF4

To edit an existing code frame, type the name of the code frame in the Code Frame field before invoking the Code Frame editor. If you do not specify the name of a code frame, the editor is empty when displayed.

Note: For information about the functions available through this menu, see **Code Frame Menu Function**, page 57. For information about modifying the supplied code frames, see **Edit Code Frame Function**, page 58.

Using the Code Frame Editor

The following example shows a code frame in the Code Frame editor:

```
Code Frame ......... CSLC9                                             SIZE 29281
Description ........ Browse-Select* model subroutines                   FREE 29520
>                                              > + ABS X X-Y _ S 408  L 1
Top...+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C
  *
  * Subroutines (in alphabetical order).
  *
  CHECK-WILD-CHARACTER                                                        1
  *************************************************************************    "
  DEFINE SUBROUTINE CHECK-WILD-CHARACTER                                     "
  *************************************************************************    "
  *                                                                           "
  * Check for wild characters in the input key and                            "
  * reset minimum and maximun values for the key accordingly                  "
  RESET #WILD-CHAR #LAST-POS                                                  "
  FOR #WINDX = 1 TO 3                                                         "
    EXAMINE #INPUT.#CHAR-ARRAY(*) FOR                                         "
           CDWILDA.#WILD-CARD-CHARS(#WINDX) GIVING INDEX #FIRS-POS(#WINDX)   "
  END-FOR                                                                     "
  /* Find the first wild character                                            "
  FOR #WINDX = 1 TO 2                                                         "
     IF #FIRS-POS(#WINDX) = 1 THRU #FIRS-POS(#WINDX + 1) OR                  "
  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
```

Example of a Code Frame

The Code Frame editor supports all generic Natural edit commands except the RUN, CHECK, TEST, STOW, and SAVE commands. This editor has no line numbers, but it does have two extra fields to the right of the edit area: T (Type) and C (Condition). Natural Construct uses these fields to control the generation process for each code frame.

The fields in the Code Frame editor are:

Field	Description
Code Frame	Name of the code frame that is currently in the editor (the name specified in the Code Frame field on the Code Frame menu).
Description	Brief description of the code frame.
SIZE	Size of the code frame (in bytes).
FREE	Number of bytes currently available in the editor.
>	Command line prompt, at which you can: • Enter “Q”, “QUIT”, or “.” to close the editor • Issue an edit command (for a list of the edit commands, see **Edit Commands**, page 110)
+	Direction indicator. The plus sign (+) indicates that the ADD, MOVE, COPY, INSERT, and SCAN commands operate in a forward (from top to bottom) direction. To have the commands operate in a backward direction (from bottom to top), type a minus sign (-) over the plus sign. Edit commands use the direction indicator to determine whether to place lines before the first line in the editor or after the last line in the editor. For example, using the ADD edit command and a + direction indicator adds lines after the last line in the editor; using the ADD edit command and a - direction indicator adds lines before the first line in the editor.
ABS	Absolute field, which is used in conjunction with the SCAN and CHANGE edit commands. When this field is marked, the system scans for or changes the specified characters, including those within words. If you specify a blank in this field, the system scans for or changes the specified characters only if they are a separate entity (delimited by blanks or special characters).

Field	Description (continued)
X-Y	X and Y delimiters. To confine SCAN and CHANGE commands to code within an X-Y delimited range, mark this field. Text outside the X-Y range is not affected.
S	Total number of lines of code currently in the editor.
L	Number of the first line currently displayed in the editor.

Field	Description (continued)
T	Editor line type. Valid line types are: • N Indicates this is a subprogram line and the specified Natural subprogram is invoked during generation. If you specify N, the line is automatically formatted as follows: `Subprogram: _______   Parameter: ______     N` Type the name of the subprogram in the Subprogram field. If the subprogram is invoked more than once or in multiple code frames, you can specify a constant (which is placed in the #PDA-FRAME-PARM field of the CU—PDA parameter data area) in the Parameter field. The subprogram can test this field to determine where the subprogram is invoked. • F Indicates that this is a secondary (nested) code frame line and the specified code frame is invoked during generation. The names of nested code frames should all end with a question mark (?). This naming convention greatly reduces the time and effort required to modify code frames. • U Indicates points where developers can insert user exit code. (You can specify additional attributes using the .E command after the line is specified.) • * Indicates code frame comments, which are not used by the generated module. • B Indicates that blank lines are valid and will be generated into the source area. This line type is used to explicitly hold blank line positions. Natural Construct will not change the contents of any B type line. If text is entered on a B type line, the text is generated; if a B type line is blank, a blank line is generated.

Note: Natural code does not require blank lines, whereas other scripting languages use the blank line concept extensively.

Field	Description (continued)
	• X Indicates that the text portion of the line must contain the name of a user exit, and the code in the C field must be a number from 1 to 9. If the user exit exists in the User Exit editor when the program is generated, this line indicates that the condition is true. • Blank Indicates that this line is constant text and is inserted directly in the generated program, based on the value in the C field. Whenever a code frame is updated, Natural Construct compresses blank lines and lines marked with B.
C	Condition level of the corresponding lines. Valid levels are: • *n* (1–9) Indicates a new condition for this level. The conditions are Boolean combinations of the condition constants specified for the generator. If the condition specified on the line is true, all subsequent code with quotation marks (") is included in the generated program. You can nest conditions by specifying a number greater than 1. (For information about setting up conditions for your generators, see **Code Frame Conditions**, page 135. • " Indicates that text on this line is a continuation of the previous block of code and subject to the last condition specified. • blank Indicates that the corresponding line is constant text and is included unconditionally.

Order of Command Execution

The Code Frame editor executes commands in the following order:

- Modifies text.
- Executes line commands. Specify in the text area of the editor and precede each command with a period (.E, for example).
- Executes edit commands. Specify at the > prompt (ADD, for example).

The line and edit commands for the Code Frame editor are described in the following sections.

Line Commands

You can issue line commands in the Code Frame editor that copy, move, and delete lines of code. Line commands must be entered in the edit area (not at the > prompt), begin with a period (.), and start in the first column position of a line. Except for the .L command, you should only use line commands on modified code after you press Enter.

If the direction indicator is a plus sign (+, indicating from top to bottom), the copied, moved, or inserted lines are placed below the line on which the command is specified. If the direction indicator is a minus sign (-, indicating from bottom to top), the lines are placed above the line on which the command is specified.

Note: To avoid shifting the T (Type) and C (Condition) fields, the SHIFT, .J, and .S commands are not available in the Code Frame editor.

The line commands applicable in the Code Frame editor are:

Command	Function
.C(*nn*)	Copies the current line *nn* times, where *nn* is the number of times. The default is one time.
.CX(*nn*)	Copies the line marked X *nn* times, where *nn* is the number of times. The default is one time.

Command	Function (continued)
.CY(*nn*)	Copies the line marked Y *nn* times, where *nn* is the number of times. The default is one time.
.CX-Y(*nn*)	Copies the block delimited by X and Y *nn* times, where *nn* is the number of times. The default is one time.
.D(*nn*)	Deletes *nn* lines, where *nn* is the number of lines. The default is one line.
.E	Specifies additional attributes for user exits. If the corresponding line is type U (user exit point), you can specify additional attributes for the user exit by issuing the .E command.
.G(*model, parameters*)	Invokes the Generation subsystem of Natural Construct.
.I(*nn*)	Inserts *nn* lines, where *nn* is the number of lines. The default is 9 lines; the maximum is 9 lines. The Code Frame editor suppresses unused lines unless they are marked with a B line type.
.IF (*code frame*)	Inserts the specified code frame on the line below the line on which the command is specified. The direction indicator has no effect on this command.
.I(*member,startline, number of lines*)	Places a *member* from the current library on to a specified line in the editor. You can also specify a starting line and the total number of lines to include.
.L	Restores the line on which the command is specified to its previous state. (This command is similar to the LET edit command, but it applies to one line only.)
.MX	If the direction indicator is a plus sign (+), this command moves the line marked X to the line after the one on which .MX is specified. If the indicator is a minus sign (-), this command moves the line marked X to the line above the one on which .MX is specified.

Command	Function (continued)
.MY	If the direction indicator is a plus sign (+), this command moves the line marked with Y to the line after the one on which .MY is specified. If the direction indicator is a minus sign (-), this command moves the line marked Y to the line above the one on which .MY is specified.
.MX-Y	Moves the block of lines delimited by the X and Y markers. If the direction indicator is a plus sign (+), this command moves the block to the line after the one on which .MX-Y is specified. If the direction indicator is a minus sign (-), this command moves the block to the line above the one on which .MX-Y is specified.
.N	Marks the line for the POINT edit command (for more information, see the POINT command in **Positional Edit Commands**, page 112).
.P	Moves the line on which the command is specified to the top of the panel.
.W(*nn*)	Inserts *nn* blank lines in the editor, where *nn* is the number of lines. The default is 9 lines. Whenever the code frame is updated, Natural Construct suppresses any unused lines unless they are marked as B line types.
.X	Marks a line or marks the beginning of a block of lines that ends with a line marked Y.
.Y	Marks a line or marks the end of a block of lines that begins with a line marked X.

Edit Commands

Specify the following edit commands at the command prompt (>):

Command	Function
ADD	Adds 9 blank lines to the editor.
CHANGE	Scans for text and replaces it with the specified value. The syntax is: `CHANGE 'scanvalue'replacevalue'` You can use any special character as a delimiter, as long as you do not use the same character within the command. Unless X and Y line commands limit the range, this edit command performs changes to the entire edit buffer.
CLEAR	Clears the current contents of the edit buffer.
DX	Deletes the line marked X.
DY	Deletes the line marked Y.
DX-Y	Deletes the lines between the X and Y markers, inclusively.
END	Ends the edit session and invokes the previous menu.
EX	Deletes all lines before the X marker.
EY	Deletes all lines after the Y marker.
EX-Y	Deletes all the lines before the X marker and after the Y marker.
HELP	Displays help text for the Code Frame editor.
LET	Restores lines to their previous state, should you inadvertently change them. Specify the command before pressing Enter. (This command is similar to the .L line command, but applies to the entire buffer.)
LIST	Lists the current contents of the Main buffer.

Command	Function (continued)
PROFILE	Invokes a window in which you can modify PF-key settings and edit specifications for the current edit session (see **Maintain Current PF-key Profile Window**, page 113).
QUIT or .	Ends the edit session and invokes the previous menu.
READ *program*	Reads the Natural source for *program* into the edit buffer.
RESET	Clears the X and Y markers.

SCAN	Scans for data in the edit area in the following ways:
	`SCAN 'scanvalue`
	Scans for text within the delimiters.
	`SCAN scan value`
	Scans for the entire text after the SCAN keyword, including spaces.
	You must use delimiters for scan values that begin with a non-alphanumeric character.
	If the direction indicator is a plus sign (+), the scan begins at the first line displayed on the panel and continues to the end of the text. If the indicator is a minus sign (-), the scan begins at the last line and continues to the beginning. When the scan value is found, S is displayed in the left column next to the target line(s).
	You can also limit the scan range by marking the X-Y field at the top of the Code Frame editor. For a description of this field, see **Using the Code Frame Editor**, page 102.

Command	Function (continued)
UPPER	Invokes a window in which you can specify one or more of the following translation options: • Comments Translates all lower case text in comments (text preceded by *, **,or /*). • Statements Translates all lower case text in statements, including variables. • Quoted strings Translates all lower case text in quoted strings. • Programming Translates text for the programming language specified.
*	Redisplays the last command issued.

Positional Edit Commands

If the code frame in the edit buffer is too large to be displayed in its entirety on the panel, use the following edit commands to scroll through the information:

To scroll	Then
Forward or backward *nnnn* lines.	Enter +*nnnn* or -*nnnn* at the > prompt.
Forward or backward half a panel.	Enter +H or -H at the > prompt.
Forward or backward one panel.	Enter +P or -P at the > prompt.
Forward one panel (if text was not changed).	Press Enter.
Forward to end of code frame.	Enter BOTTOM or ++ at the > prompt.
Line on which .N line command is specified to top of panel.	Enter POINT at the > prompt.

To scroll	Then (continued)
Backward to top of panel.	Enter TOP or -- at the > prompt.
To the line marked X or Y.	Enter X or Y at the > prompt.
To line *nnnn*.	Enter *nnnn* at the > prompt.

Maintain Current PF-key Profile Window

The Maintain Current PF-key Profile window allows you to change (for the current session only) the PF- and PA-key settings, the number of updates before an automatic save, and the name of the recovery member.

➢ To display the Maintain Current PF-key Profile window:

1 Enter PROFILE at the > prompt in the Code Frame editor.
The following window is displayed:

```
CS-PROF                  Natural Construct                   CS-PRFM0
Jun 20              Maintain Current PF-Key Profile             1 of 1

 PF1 =  -_______________ PF2 =  T_______________ PF3 =  B_______________
 PF4 =  -H______________ PF5 =  +H______________ PF6 =  +P______________
 PF7 =  N_______________ PF8 =  ________________ PF9 =  Q_______________
 PF10=  ________________ PF11=  ________________ PF12=  ________________
 PF13=  ________________ PF14=  ________________ PF15=  ________________
 PF16=  ________________ PF17=  ________________ PF18=  ________________
 PF19=  ________________ PF20=  ________________ PF21=  ________________
 PF22=  ________________ PF23=  ________________ PF24=  ________________
 PA1 =  ________________ PA2 =  SCAN____________ PA3 =  ________________

Auto save numbers ............      In member .......... EDITWORK
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11-
      help  retrn
Changes DO NOT affect your edit profile outside Construct
```

Maintain Current PF-Key Profile Window

This window displays the various settings in effect for the current edit session. The PF-key settings for the Natural Construct editors are determined in the same manner as those for the Natural editor. If you have a profile that corresponds to your user ID, Natural Construct uses those defaults.

The fields in the Maintain Current PF-Key Profile window are:

Field	Description
PF1= etc.	Functions assigned to the PF- and PA- keys. You can add new functions by typing a command next to the desired key, or modify existing functions by typing a new command over the one displayed.
Auto save numbers	Number of updates allowed before the source is automatically saved. If this field is blank or 0 (zero), Natural Construct does not automatically save work.
In member	Name of the program that is overwritten each time the specified number of updates is exceeded (by default, EDITWORK). To change the name of the program, type a new name over the one displayed. If this field is blank, Natural Construct does not automatically save work.

Note: Any changes made to the current profile take effect immediately and remain in effect for the duration of the current edit session. These changes do not affect the Natural edit profile.

Edit Recovery

The Natural Construct editors can automatically save work in the edit buffer after a certain number of updates. The number specified in the Auto save numbers field in the Maintain Current PF-Key Profile window determines how often the work is saved. If the Auto save numbers field is blank, Natural Construct does not automatically save work.

In the Maintain Current PF-Key Profile window, you can also specify the name of the recovery member where you want your work saved.

➢ To retrieve lost code:

1 Invoke the Code Frame editor.

2 Read EDITWORK (or whatever name you specified as your recovery member name in the In member field) into the edit buffer.

3 Re-specify the description, as it is not saved in the recovery member.

Note: To recover edits, the value in the Auto save numbers field must not be blank or 0 (zero) and the value in the In member field must be specified. For information, see **Maintain Current PF-key Profile Window**, page 113.

Note: Save your work using a unique recovery member name, such as your user ID. This way, your work will not be overwritten by another user using the same recovery member name in the same library.

GUI Sample Subprogram

Sample subprograms are invoked from a user exit. These subprograms help the developer create user exit code by providing a starting sample. The GUI sample subprogram is a client version of the mainframe sample subprogram — minus the input statements. When Natural Construct generates a model on the client, it bypasses the mainframe sample subprogram and reads the GUI sample subprogram instead.

CREATING NEW MODELS

This chapter describes the procedure to create a new Natural Construct model and contains information about testing the components of a model and debugging a model. In addition, it describes special considerations for building statement models and presents a summary of tips and precautions. A section at the end of this chapter provides information about the utility subprograms and helproutines supplied with Natural Construct. These utilities can help you create your new model.

The following topics are covered:

Components of a Natural Construct Model

A Natural Construct model is the combination of several components which, when used together, generate a Natural module. Natural Construct provides models you can use to help generate many of these components. The following table lists the components of a Natural Construct model, as well as the name of the model you can use to help generate each component (if applicable):

Component	Model Used To Generate
Code frames	None (create manually or copy and modify existing).
Model PDA	CST-PDA model described in **Parameters for the CST-PDA Model**, page 217.
Translation LDAs for dynamic translation)	None (create manually or copy and modify existing).
Maintenance maps	Map model (described in *Natural Construct Generation User's Manual*).
Maintenance subprogram(s)	CST-Modify or CST-Modify-332 model described in **CST-Modify Model**, page 239.
Pre-generation subprogram	CST-Pregen model described in **Parameters for the CST-Pregen Model**, page 259.
Generation subprograms	CST-Frame model described in **Parameters for the CST-Frame Model**, page 272.
Post-generation subprogram	CST-Postgen model described in **Parameters for the CST-Postgen Model**, page 265.
Clear subprogram	CST-Clear model described in **Parameters for the CST-Clear Model**, page 221.
Save subprogram	CST-Save model described in **Parameters for the CST-Save Model**, page 233.
Read subprogram	CST-Read model described in **Parameters for the CST-Read Model**, page 227.

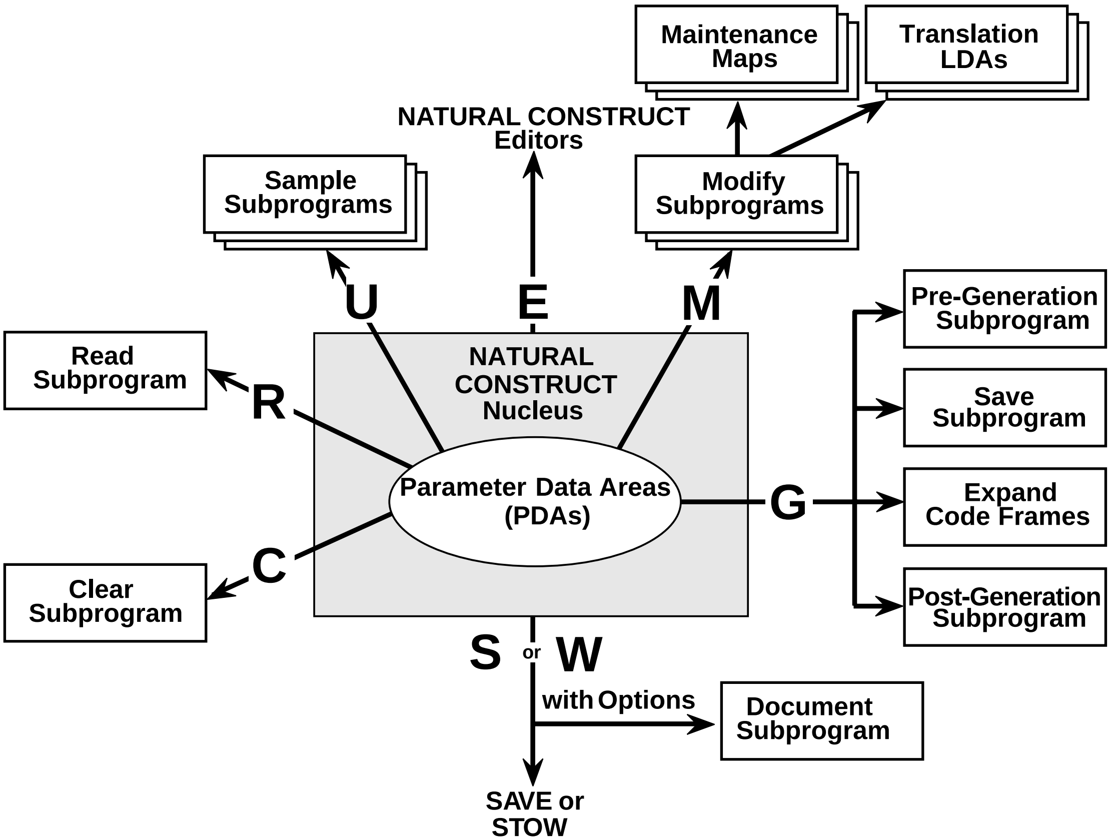
Component	Model Used To Generate (continued)
Sample subprogram(s)	CST-Frame model described in **Parameters for the CST-Frame Model**, page 272.
Document subprogram	CST-Document model described in **Parameters for the CST-Document Model**, page 277.
Stream subprogram	CST-Stream model described in **Parameters for the CST-Stream Model**, page 289.
Validate subprogram	CST-Validate model described in **Parameters for the CST-Validate Model**, page 283.

How Natural Construct Executes a Model

The Natural Construct nucleus is a sophisticated driver program that assembles the model components and sets them in motion. Although it invokes the model subprograms at the appropriate time in the generation process and performs the functions common to all models, it is not aware of the code generated by the models.

The nucleus communicates with the model subprograms through standard parameter data areas (PDAs). These PDAs contain fields assigned by Natural Construct, as well as fields that are redefined as required by a model

The generation process uses each model component at a different time. The following diagram illustrates the components of a model and how they interact with each other and the nucleus. The large letters correspond to the function codes a user enters on the Generation main menu to invoke the corresponding subprogram(s).



Components of a Model

Building a New Model

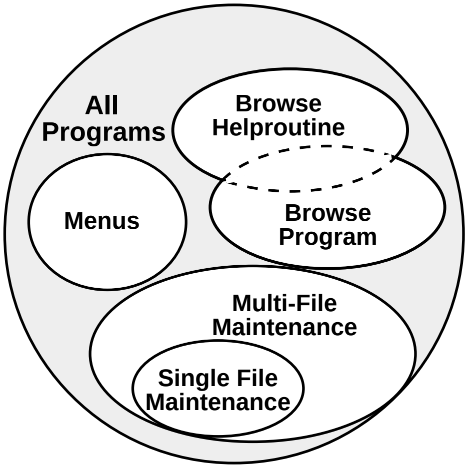
The following sections describe the procedure to build a new Natural Construct model.

➢ To build a new model:

1. Define the scope of the model.
2. Create the prototype.
3. Scrutinize the prototype.
4. Isolate the parameters in the prototype.
5. Create code frame(s) and define the model.
6. Create the model PDA (parameter data area).
7. Create the translation LDAs (local data areas) and maintenance maps (panels).
8. Create the model subprograms.

Step 1: Define the Scope of the Model

Before you begin, define what module type the model will generate. The following diagram illustrates the varying scope and overlapping functionality of different module types:



Scope and Functionality of Your Model

Is the Scope Too Broad?

If your model contains many parameters (one that generates complex modules with broad functionality), it may:

- Confuse and frustrate developers
- Lengthen the time it takes developers to specify parameters
- Require complex code frames with many conditions
- Make the model so flexible that generated code may deviate from standards

For example, the model should not allow programmers/analysts to define PF-keys used for standard features (these should be standardized across all applications). On the other hand, these models can be very powerful and flexible — once the developer is familiar with them.

Is the Scope Too Narrow?

If you build a model containing few parameters (one that generates simple modules with narrow functionality), it may:

- Make the model inflexible
- Limit the model's usefulness

On the other hand, these models are simple to use and easy to maintain.

What to Generate and Why

Typically, models generate Natural source code — but the possibilities are endless. Natural Construct was designed to generate text in any form: Unix scripts, JCL, Cobol, Visual Basic, C++, HTML scripts, etc.

As a general rule, you will want your models to generate common modules that cannot be parameterized at execution time. This type of module often involves file accesses or compile-time statements, such as:

- map names
- parameter lists
- FORMAT statements
- I/O statements
- file definitions

Alternately, you may want the model to generate modules that can be parameterized at execution time but are hardcoded for performance reasons (menus, for example).

Step 2: Create the Prototype

Once you determine the purpose and scope of the model, you can create a Natural module (program, subprogram, map, etc.) to base your model on. This module should perform all the functions you defined for the scope of the model.

If the scope contains mutually-exclusive options, you should prepare several prototypes. For example, if the Natural code to maintain a file with a superdescriptor is significantly different from the code that maintains a file with a descriptor, create two prototypes. If possible, generate the more complex prototype first and add the simpler prototype later.

Step 3: Scrutinize the Prototype

After creating your prototype Natural program, perform the following checks:

- Ensure that the program is fully commented
- Check the code indentation
- Check the clarity of the program
- Ensure that the program conforms to standards
- Evaluate the efficiency of the program
- Ensure that variable names are sorted

After you check the prototype as thoroughly as possible, have someone else perform the same checks and tests.

Step 4: Isolate the Parameters in the Prototype

The basic premise behind program generation is to take a working module that performs a fixed function and generalize the module so it performs varying functions based on parameter values.

Which Elements Need to be Parameterized?

The first step is to determine which program lines remain constant in the generalized module and which lines vary. If the prototype reads a file and displays information, for example, the file and information varies with each generation. Therefore, this information must be parameterized. To make the prototype easier to generate, try to reduce the number of parameters in your prototype without affecting the functionality.

Remove Redundant Parameters

Programs often contain several instances of the same parameter. These can be reduced to a single instance of the parameter by using a constant variable:

Redundant Parameters	Single Parameter
`DEFINE DATA LOCAL`	`DEFINE DATA LOCAL`
`01 #A(A1/1:50`	`01 #ASIZE(P3) CONST<50>`
`.`	`01 #A(A1/1:#ASIZE)`
`.`	`.`
`END-DEFINE`	`END-DEFINE`
`.`	`.`
`.`	`.`
`IF #A(#CUR:50) NE ' ' THEN`	`IF #A(#CUR:#ASIZE) NE ' ' THEN`
`FOR #I = #CUR TO 50`	`FOR #I = #CUR TO #ASIZE`
`etc.`	`etc.`

This technique makes the prototype easier to generate, since there are fewer parameter instances. In addition, the generated programs are easier to read, since it is more obvious that the constant value always refers to the same thing.

Compile Time Versus Execution Time

Ensure that your prototype does not contain hardcoded parameters that could easily be calculated at execution time. Consider the following examples:

Unnecessary Constant

```
DEFINE DATA LOCAL
   01 #MAX-LINES(P3) CONST <15>
   01 #LINE-NR(P3/1:#MAX-LINES)
INIT<1,2,3,4,5,6,7,8,9,10,11,12,13,
               15>
END-DEFINE
```

Determine at Execution Time

```
DEFINE DATA LOCAL
   01 #MAX-LINES(P3) CONST <15>
   01 #LINE-NR(P3/1:#MAX-LINES)
   01 #I (P3)
END-DEFINE
FOR #I = 1 TO #MAX-LINES
   ASSIGN #LINE-NR (#I) = #I
END-FOR
```

Both the INIT statement on the left and the FOR loop on the right initialize an array with consecutive numbers. However, the code on the right does not vary based on the value of #MAX-LINES. No special processing is required to generate the code on the right, as it is constant for each generation. To make the prototype more flexible and easier to generate, use Natural system variables to determine the values at execution time. Ensure you do not sacrifice program efficiency to achieve this goal.

Step 5: Create Code Frame(s) and Define the Model

Once you have written and tested your prototype, save it in the SYSCST library. The next step is to create the code frame(s) used by the model. If the prototype program is large, you can create multiple code frames with a portion of the program in each code frame. In addition, you can use nested code frames.

First, invoke the Code Frame editor and read in your prototype. Next, determine the parameters for the code frame. These include substitution parameters, code frame conditions, generation subprograms, nested code frames, and user exits.

The following example shows a code frame in the Code Frame editor:

```
Frame .............. PRSLCC9                                          SIZE 1125
Description ........ Browse Select Code(c) Inline Subroutines         FREE 59940
>                                              > + ABS X X-Y X S 18   L 1
All...+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C
  *
  * Subroutines (in alphabetical order).
  * Check wildcard processing                                             *
  CHECK-WILD-CHARACTER                                                      1
  CUSLCWC?                                                              F "
  * Initializations                                                      *
  CUSLCI?                                                                F
   Subprogram: CUSCGBND Parameter: INITIALIZE                            N
  * Initialize the input key to the minimum key value specified
    ASSIGN #INPUT.&PRIME-KEY = #MIN-KEY-VALUE
  Process Selected Column or Record                                      *
  PROCESS-SELECTION-COLUMN OR PROCESS-SELECTED-RECORD                      1
  CUSLCPS?                                                              F "
  * Final Processing                                                      *
  CUSLCFP?                                                              F
  MISCELLANEOUS-SUBROUTINES                                            U
  PERFORM FINAL-PROCESSING
  END
  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
```

Example of a Code Frame in the Code Frame Editor

For a description of the Code Frame editor, see **Using the Code Frame Editor**, page 102. For information about invoking the Code Frame editor, see **Edit Commands**, page 110.

The code frame above shows different methods of supplying parameters for a code frame. The following sections describe each of these methods.

Substitution Parameters

One type of code frame parameter is substitution parameters. These parameters are always present in the same format, but their values change. You can usually assign substitution parameters by replacing the values with unique substitution strings. To identify a parameter as a substitution, use an ampersand (&) at the beginning of the substitution string in the editor.

The code frame example on the previous page contains the following substitution parameter:

```
* Initialize the input key to the minimum key value specified
  ASSIGN #INPUT.&PRIME-KEY = #MIN-KEY-VALUE
```

Values are substituted after the module is fully generated. The unique identifier (&PRIME-KEY in the example above) is substituted for the derived value by placing the unique identifier and the value in the Natural stack.

For more information about substitution during the post-generation phase, see **Post-generation Subprogram**, page 172.

Substitution parameters cannot span multiple lines and always begin with an ampersand (&). The substitution string can be up to 32 characters in length. The substitution value can be up to 72 characters in length.

The name of the parameter should correspond to the name of the model PDA variable that supplies the value. For example, &VAR is assigned the value of #PDA-VAR or #PDAX-VAR. Following this naming convention makes it easier to generate the model subprograms using the supplied models. For more information about the model PDA, see **Model PDA**, page 146.

Parameters Supplied by Generation Subprograms

A generation subprogram can supply the code frame parameters. When a substitution parameter spans more than one line, varies in length, or performs complex calculations (centering, for example), you can supply the parameters in a generation subprogram.

An example of this type of parameter is a file view where the developer specifies the name of the file to use. Instead of supplying a list of the fields in the view, you can specify the name of a subprogram to supply this list.

To indicate that a subprogram is called on this line, enter N (Natural subprogram) in the corresponding T (Type) field. To pass a parameter to the subprogram, specify the parameter value after the subprogram name. The parameter can be a literal string, 1 to 32 characters in length.

Natural Construct passes the following structures to each generation subprogram:

- Model PDA (CU*xx*PDA), containing model-specific parameters
- CU—PDA, containing the standard generation parameters
- CSASTD, containing the standard messaging parameters

The #PDA-FRAME-PARM field in the CU—PDA is used to pass the parameter literal string.

The code frame example on page 125 contains the following line of code:

```
Subprogram: CUSCGBND Parameter: INITIALIZE                       N
```

This line indicates that the Natural CUSCGBND subprogram is invoked from this point in the code frame and passed the INITIALIZE value.

Because code frame parameters are supplied in a generation subprogram, the same subprogram can be invoked several times within the code frame. The subprogram uses the value of the passed parameter to determine what to generate each time.

Parameters Supplied by Nested Code Frames

Another method of supplying parameters to a code frame is to use nested code frames. As with generation subprograms, nested code frames can perform substitutions on lines of varying length. In fact, nested code frames have all substitution options available to the calling code frame. For example, a nested code frame can have substitution parameters, generation subprograms, and its own nested code frames.

All code frames supplied with Natural Construct end with 9 (see the description of the Code frame(s) field in **Maintain Models Function**, page 48) and 8 is reserved for any future updates. When you reference a code frame from within another code frame (nested), change the 9 to a question mark (?). The question mark (?) indicates a hierarchy structure in which Natural Construct uses the code frame with the lowest number during generation.

For specific hardcoded references, you can specify a nested code frame without using the question mark (?) — but if you want to change what the nested code frame generates, you must modify every calling code frame and its reference. When you use the question mark (?) character, Natural Construct automatically calls your new version of the nested code frame.

Note: To make nested code frames more reusable across multiple models, it is important to use exactly the same naming conventions. In this way, the nested code frame substitution parameters and logicals are always available within the model PDAs.

To indicate that another code frame is called on a Code Frame editor line, enter F in the corresponding T (Type) field.

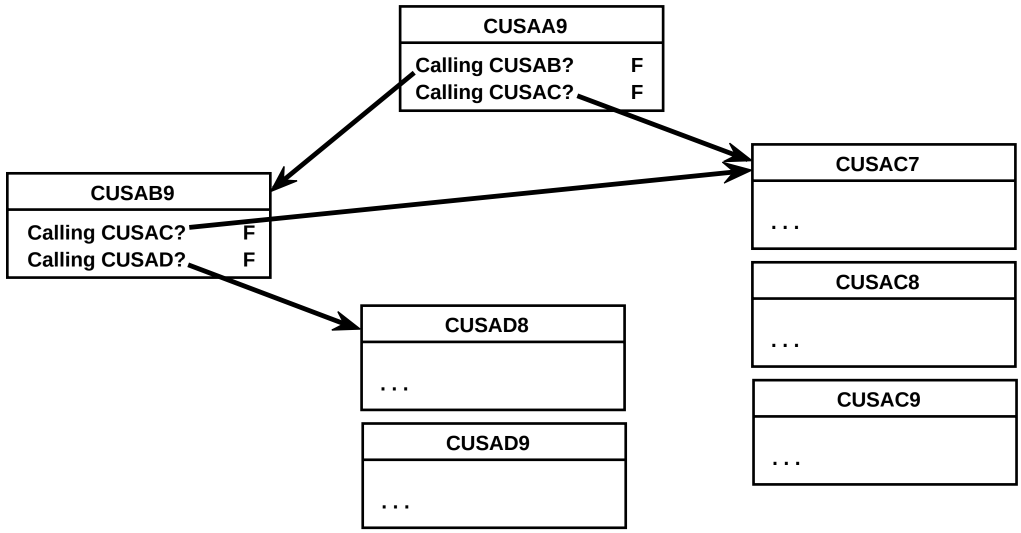
The code frame example, **Step 5: Create Code Frame(s) and Define the Model**, page 126, contains the following nested code frame:

```
CUSLCI?                                                                F
```

This line indicates that the CUSLCI*n* code frame supplies parameters for the code frame, where *n* is a number from 1 to 9 (line type F in the Code Frame editor).

To modify a supplied code frame, copy the code frame, change the 9 to a lesser number (from 1 to 7), and modify the code frame as desired. The next time Natural Construct calls that code frame, the one you created with the lesser number is used. For example, you can copy the CUSLCI9 code frame, change the name to CUSLCI7, and edit it as desired. The next time Natural Construct calls CUSLCI?, CUSLCI7 is used.

In the following example, the CUSAA9 code frame has two nested code frames (CUSAB? and CUSAC?). The arrows indicate which code frame is used:



Example of Calling Nested Code Frames

Note: Ensure that you do not create endless loops within nested code frames; endless loops result when a code frame calls itself, either directly or indirectly (through a nested code frame).

Parameters Supplied by User Exits

Parameters for a code frame can also be supplied by user exits. User exits provide maximum flexibility for defining parameters because parameters are specified in the form of embedded Natural code. User exits allow programmers/analysts to provide specialized portions of code at various points within the generated module.

Add User Exit Points

To include a user exit in a code frame, enter the name of the user exit in the text portion of a line and "U" in the corresponding T (Type) field.

You can specify additional attributes by entering ".E" at the beginning of the user exit line:

```
  Frame ............. CUSLD9                                          SIZE 5973
  Description ........ Browse Select Subp. Define Data Area          FREE 54796
  >                                              > + ABS X X-Y _ S 102  L 1
  Top...+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C
    CU--B?                                                                  F
    DEFINE DATA
    GDA-SPECIFIED                                                              1
      GLOBAL USING &GDA &WITH-BLOCK                                            "
      PARAMETER
      01 #PDA-KEY(&PARM-NAT-FORMAT)  /* Start/Returned key.
      VARIABLE-MIN-MAX AND PREFIX-IS-PDA-KEY                                   1
      01 REDEFINE #PDA-KEY                                                     "
        02 #PDA-KEY-PREFIX(&PREFIX-NAT-FORMAT)                                 "
      PARAMETER USING CDSELPDA /* Selection info
      PARAMETER USING CU—PDA  /* Global parameters
      PARAMETER USING CSASTD   /* Message information
    .eRAMETER-DATA                                                          U
      LOCAL USING CDDIALDA /* Used by dialog objects.
      LOCAL USING CDENVIRA /* Used to capture/restore previous environment.
    DIRECT-COMMAND-PROCESSING                                                 1
      LOCAL USING CDGETDCA /* Used to get direct command info.                 "
    MULTIPLE-WINDOWS                                                           1
    ....+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T
 CUSLD9 read
```

Example of Adding User Exit Points in a Code Frame

After you press Enter, the Maintain User Exit window is displayed:

```
CSMUSEX                        Natural Construct
Jul 28                         Maintain User Exit                      1 of 1
 User exit name ......... START-OF-PROGRAM
 Code frame name ........ COBB9    Conditional  N
 User exit required ..... _
 Generate as subroutine . _
 Sample subprogram ...... ________        GUI sample subprogram .. ________
 Default user exit code .
   *_________________________________________________________________________
   * Specify code to be executed at the beginning of the object subprogram.
   * This might include security checking logic.___________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
       help  retrn
```

Maintain User Exit Window

Use this window to specify information about the user exit. The fields in this window are:

Field	Description
User exit name	Name of the user exit.
Code frame name	Name of the code frame for the user exit.
Conditional	Condition code for the user exit. If the user exit is conditional (required only under certain conditions), Y is displayed. If it is not conditional, N is displayed.
User exit required	If this field is marked, the user exit is required; if this field is blank, the user exit is optional.

Field	Description (continued)
Generate as subroutine	If the user exit is used in more than one place in the module, enter Y. The code is generated as an inline subroutine. During generation, Natural Construct places the code in a subroutine with the same name as the user exit. This allows you to execute the code several times using a PERFORM *user-exit-name* statement. If the user exit is optional, the PERFORM statement can be conditional on the presence of the user exit itself (for information, see **Code Frame Conditions**, page 135). Regardless of whether user exits are generated as subroutines or embedded code, use the DEFINE EXIT keyword to specify all user exits.
Sample subprogram	If a subprogram contains the sample code for the user exit, enter the name of the subprogram. The sample code is generated after the developer enters the SAMPLE command in the User Exit editor and selects an exit. Natural Construct passes three parameter data areas (PDAs) to each sample subprogram: the model PDA, CU—PDA, and CSASTD. For more information, refer to **Step 6: Create the Model PDA**, page 142. **Note:** The SAMPLE command is executed automatically when you enter "U" on the Generation main menu or press PF11 (userX) on the last specification panel for a model that supports user exits, but has none specified.
GUI sample subprogram	GUI sample subprogram invoked when the code is being generated from the client. This subprogram should not display input panels. If the sample subprogram does not use input panels, it can be used in the GUI sample subprogram. If the sample subprogram includes input panels, create a copy and modify to use the defaults.

Field	Description (continued)
Default user exit code	If complex processing or calculations are not required, you can enter up to 10 lines of sample code. This code becomes the default sample code for this user exit.
Note:	If you specify a sample subprogram name and provide default user exit code, Natural Construct generates the default user exit code before the sample subprogram code.

Code Frame Conditions

Frequently, a block of statements is inserted in a program based on a condition or combination of conditions specified in the code frame. In the following example, the INPUT WITH TEXT+MSG USING MAP '&MAP-NAME' INPUT statement is generated if a map is used. Otherwise, the INPUT(AD=OI) is generated:

```
Top...+....1....+....2....+....3....+....4....+....5....+....6....+....7.. T C
MAP-USED                                                                    1
INPUT WITH TEXT + MSG USING MAP '&MAP-NAME'                                 "
ELSE                                                                        1
INPUT(AD=OI) *PROGRAM #HEADER1                                              "
/ *DATX #HEADER2 *TIMX                                                      "
```

Example of a Condition in a Code Frame

Note: To identify a condition line, enter a number in the C (Condition) column in the Code Frame editor. Number 1 initiates a new condition; higher numbers represent nested conditions that are only evaluated if all active lower conditions are true.

To identify a statement as conditional, enter a double quotation (") in the C column. The corresponding statement is included in the generated module only if the current condition is true.

When you use code frame conditions, consider the following points:

- The names of conditions must correspond to the names of logical variables defined in the model PDA, with the #PDAC- prefix removed. (For more information about the model PDA, see **Step 6: Create the Model PDA**, page 142.) The MAP-USED condition, for example, corresponds to the #PDAC-MAP-USED logical variable.

Note: These condition variables must be part of the redefinition of the #PDA-CONDITION-CODES field within the model PDA.

- When Natural Construct generates a module, it checks the condition code values to determine whether the condition is true. It resets the conditions before invoking the maintenance subprograms. Condition codes should be selectively set to TRUE by either the pre-generation subprogram or one of the maintenance subprograms.
- Conditions can be negated, ANDed, and ORed (in order of precedence).
- Conditions can be nested and ELSEed (ELSE refers back to the previous condition at the same level number).
- The RETURN-TO-CONDITION keyword can close levels of conditioning.
- A special condition line can check for the existence of a specific user exit. To specify this type of condition, enter the name of the user exit as the condition value and specify a line type of X. These conditions cannot be negated, ANDed, or ORed, but can be nested. They do not require a corresponding #PDAC variable.

Example of code frame conditions

```
Frame ..............ABC                                     SIZE 68
Description ........Example of conditions                  FREE 36676

  >                                     > + ABS X X-Y _ S 21 L 1
Top.+...1...+...2...+...3...+...4...+...5...+...6...+...7..  T C Notes
MAP-USED                                                       1
INPUT WITH TEXT + MSG USING MAP '&MAP-NAME'1                   “  1
ELSE                                                          1
INPUT(AD=OI) *PROGRAM #HEADER1                                 "  2
/ *DATX #HEADER2 *TIMX                                         "  2
ROOM-FOR-SKIP                                                  2
/                                                             "  3
RETURN-TO-CONDITION                                            1
/ 20T #FUNCTION-HEADING                                        "  2
 NOT MAP-CONTAINS-PARAMETERS                                      2
 CODE1-SPECIFIED                                               3
/ 16T #CODE(1) 20T #FUNCTION(1)                                "  4
 CODE2-SPECIFIED                                              3
/ 16T #CODE(2) 20T #FUNCTION(2)                                "  5
     .
     .
     .
 CODE12-SPECIFIED                                              3
/ 16T #CODE(12) 20T #FUNCTION(12)                              "  6
 RETURN-TO-CONDITION                                           2
/ 11T 'Code:' #CODE(AD=M)                                      "  7
 ELSE                                                          2
 Subprogram: CUMNGIN  Parameter                              N  "  8
RETURN-TO-CONDITION                                            1
21/1 'Direct Command:' #COMMAND(AD=M)                           "  2
RESET +MSG                                                        9
AFTER-INPUT
AFTER-INPUT                                                  X  1
PERFORM AFTER-INPUT                                            "  10
```

Higher level numbers (nested conditions) are always ANDed with previous lower condition numbers.

Notes

The lines of code corresponding to each note number on the previous page are inserted into the generated module when the following Boolean conditions are met:

Notes	Boolean Condition
1	#PDAC-MAP-USED = TRUE
2	#PDAC-MAP-USED = FALSE
3	#PDAC-MAP-USED = FALSE and #PDAC-ROOM-FOR-SKIP = TRUE
4	#PDAC-MAP-USED = FALSE and #PDAC-MAP-CONTAINS-PARAMETERS = FALSE and #PDAC-CODE1-SPECIFIED = TRUE
5	#PDAC-MAP-USED = FALSE and #PDAC-MAP-CONTAINS-PARAMETERS = FALSE and #PDAC-CODE2-SPECIFIED = TRUE
6	#PDAC-MAP-USED = FALSE and #PDAC-MAP-CONTAINS-PARAMETERS = FALSE and #PDAC-CODE12-SPECIFIED = TRUE
7	#PDAC-MAP-USED = FALSE and #PDAC-MAP-CONTAINS-PARAMETERS = FALSE
8	#PDAC-MAP-USED = FALSE and #PDAC-MAP-CONTAINS-PARAMETERS = TRUE
9	Line is inserted unconditionally.
10	Line is inserted only when the AFTER-INPUT user exit is specified in the User Exit editor before the module is generated.

Define the Model

Use the Maintain Models panel to define your model.

➢ To display the Maintain Models panel:

1 Log onto the SYSCST library.

2 Enter “MENU” at the Next prompt (in the Direct Command box for Unix). The Administration main menu is displayed.

3 Enter “M” in the Function field. The Maintain Models panel is displayed:

```
CSDFM                    N a t u r a l   C o n s t r u c t            CSDFM0
Aug 09                          Maintain Models                        1 of 1

Action .................... __ A,B,C,D,M,N,P,R
Model ..................... ________________________________
Description ........ __________________________________________________________

  PDA name ................. ________    Status window ............ _
  Programming mode ......... __          Comment start indicator .. ___
  Type .................... _            Comment end indicator .... ___

  Code frame(s) ............ ________  ________  ________  ________  ________
  Modify server specificatn  ________  ________  ________  ________  ________
                             ________  ________  ________  ________  ________
  Modify client specificatn  ________  ________  ________  ________  ________
                             ________  ________  ________  ________  ________

  Clear specification ...... ________    Post-generation .......... ________
  Read specification ....... ________    Save specification ....... ________
  Pre-generation ........... ________    Document specification ... ________
Command ........... ___________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit  frame                                           main
```

Maintain Models Panel

Use this panel to specify the names of the model components (the generation subprograms require this model definition); the specified components do not have to currently exist. (When naming the model components, use the naming conventions described in the following section.) For a description of the Maintain Models panel, see **Maintain Models Function**, page 48.

Naming Conventions for Model Components

Standardizing the names of the various components of a model makes it easier to write and debug models. All supplied model subprograms, maps, and data areas are named CU*xx*, where *xx* uniquely identifies each model. When naming the model components, we recommend you use the following naming conventions:

Name	Model Component
CU*xx*PDA	Parameter data area.
CU*xx*R	Read subprogram.
CU*xx*C	Clear subprogram.
CU*xx*MA	First maintenance subprogram.
CU*xx*MA*n*	Map associated with the first maintenance subprogram. To support dynamic translation, use a zero (0) in the last position of the map name. To display a map based on the current value of the *Language system variable, use a *Language value in the last position of the map name.
CU*xx*MAL	Translation local data area (LDA) associated with the first maintenance subprogram. A translation LDA contains the names of all variables that are initialized to the maintenance map text and can be translated. You cannot dynamically translate a map to another language unless the module that invokes the map has a corresponding translation LDA.
CU*xx*MB	Second maintenance subprogram.
CU*xx*MB*n*	Map associated with the second maintenance subprogram.
CU*xx*MBL	Translation LDA associated with the second maintenance subprogram.

Name	Model Component (continued)
CU*xx*S*yyy*	Sample user exit code subprograms, where *yyy* is a 1- to 3-character suffix that uniquely identifies each sample subprogram. For example, the CUFMSRIN sample subprogram supplies REINPUT statements for the Maint model (if required).
CU*xx*G*yyy*	Generation subprograms, where *yyy* is a 1- to 3- character suffix that uniquely identifies each generation subprogram. For example, the CUMNGGL subprogram generates parameter variables for the Menu model (when a length and format are specified).
CU*xx*PR	Pre-generation subprogram.
CU*xx*PS	Post-generation subprogram.
CU*xx*S	Save subprogram.
CU*xx*D	Document subprogram.

To modify the supplied Natural Construct models, copy the subprograms and change the prefix from CU to CX (do not modify the supplied subprogram). This way, you can identify the modified subprograms and include any changes in future versions of Natural Construct.

After defining a model, it can be used in the Generation subsystem.

Step 6: Create the Model PDA

All models require three parameter data areas (PDAs). Two of the data areas are supplied with Natural Construct. You create the model PDA for each model.

PDAs pass information between the nucleus and the model and code frame subprograms. Every model subprogram uses the following external PDAs:

PDA	Description
Model PDA	User-created and named CU*xx*PDA, where *xx* uniquely identifies the model. This PDA contains variables and conditions specific to the model. It is the only PDA you must create. You can use the CST-PDA model to create the model PDA. For a description of the CST-PDA model, see **Parameters for the CST-PDA Model**, page 217.
CU—PDA	Supplied with Natural Construct.
CSASTD	Supplied with Natural Construct.

These PDAs must contain the following fields:

PDA	Required Fields	Format
Model PDA (varies for each model)	#PDA-CONDITION-CODES #PDA-USER-AREA	L/1:75 A100/1:40
CU—PDA (same for every model)	#PDA-MODE #PDA-OBJECT-TYPE #PDA-MODIFY-HEADER1 #PDA-MODIFY-HEADER2 #PDA-LEFT-PROMPT #PDA-LEFT-MORE-PROMPT #PDA-RIGHT-PROMPT #PDA-RIGHT-MORE-PROMPT #PDA-PHASE #PDA-DIALOG-METHOD #PDA-TRANSLATION-MODE	A2 A1 A60 A54 A11 A9 A11 A9 A1 I1 L

PDA (continued)	Required Fields	Format
	#PDA-USERX-NAME	A10
	#PDA-PF-NAME	A10/1:12
	#PDA-MAIN-NAME	A10
	#PDA-RETURN-NAME	A10
	#PDA-QUIT-NAME	A10
	#PDA-TEST-NAME	A10
	#PDA-BACKWARD-NAME	A10
	#PDA-FORWARD-NAME	A10
	#PDA-LEFT-NAME	A10
	#PDA-RIGHT-NAME	A10
	#PDA-HELP-NAME	A10
	#PDA-AVAILABLE1-NAME	A10
	#PDA-AVAILABLE2-NAME	A10
	#PDA-AVAILABLE3-NAME	A10
	#PDA-PF-NUMBER	N2/1:12
	#PDA-MAIN	N2
	#PDA-RETURN	N2
	#PDA-QUIT	N2
	#PDA-TEST	N2
	#PDA-BACKWARD	N2
	#PDA-FORWARD	N2
	#PDA-LEFT	N2
	#PDA-RIGHT	N2
	#PDA-HELP	N2
	#PDA-AVAILABLE1	N2
	#PDA-AVAILABLE2	N2
	#PDA-AVAILABLE3	N2
	#PDA-PF-KEY	A4
	#PDA-PF-MAIN	A4
	#PDA-PF-RETURN	A4
	#PDA-PF-QUIT	A4
	#PDA-PF-TEST	A4
	#PDA-PF-BACKWARD	A4
	#PDA-PF-FORWARD	A4
	#PDA-PF-LEFT	A4
	#PDA-PF-RIGHT	A4
	#PDA-PF-HELP	A4
	#PDA-PF-AVAILABLE1	A4
	#PDA-PF-AVAILABLE2	A4
	#PDA-PF-AVAILABLE3	A4

PDA (continued)	Required Fields	Format
	#PDA-TITLE	A25
	#PDA-GEN-PROGRAM	A8
	#PDA-MODEL-VERSION	N2.2
	#PDA-HELP-INDICATOR	A4
	#PDA-USER-DEFINED-AREA	A1/1:100
	#PDA-UNDERSCORE-LINE	A80
	#PDA-RIGHT-PROMPT-OF	A4
	#PDA-DISPLAY-INDICATOR	A4/1:10
	#PDA-CURS-FIELD	I4
	#PDA-CV1	C
	#PDA-CV2	C
	#PDA-CV3	C
	#PDA-CV4	C
	#PDA-CV5	C
	#PDA-CV6	C
	#PDA-CV7	C
	#PDA-CV8	C
	#PDA-SCROLL-INDICATOR	A4
	#PDA-DYNAMIC-ATTR-CHARS	A1/1:13
	#PDA-FRAME-PARM	A32
	#PDA-SYSTEM	A32
CSASTD	MSG	A79
(same for	MSG-NR	N4
every model)	MSG-DATA	A32/1:3
	RETURN-CODE	A1
	ERROR-FIELD	A32
	ERROR-FIELD-INDEX1	P3
	ERROR-FIELD-INDEX2	P3
	ERROR-FIELD-INDEX3	P3

The following sections describe the layout of these PDAs.

Note: The CSASTD PDA is used by every model. It passes messages between subprograms and is typically used for error handling.

Model PDA

The following example shows a model PDA:

```
Parameter CUETPDA   Library SYSCST                            DBID  19 FNR  28
Command                                                                    > +
I T L Name                             F Leng Index/Init/EM/Name/Comment
Top - -------------------------------- - ---- --------------------------------
    1 CUETPDA                                 /* Construct Model PDA
    2 #PDA-CONDITION-CODES             L      (1:75) /* Conditions in frames
 R  2 #PDA-CONDITION-CODES                    /* REDEF. BEGIN : #PDA-CONDITION
    3 #PDAC-USE-MSG-NR                 L      /* TRUE IF MESSAGE NUMBERS ARE U
    3 #PDAC-FILE-NAME-SPECIFIED        L
    3 #PDAC-FIELD-NAME-SPECIFIED       L
    3 #PDAC-PDA-SPECIFIED              L
    3 #PDAC-COMPLEX-FIELD              L      /* Field is a PE, MU a STRUCT.or
  *                                           /* REDEFINE
    3 #PDAC-SCROLLING                  L      /* Scrolling
    3 #PDAC-NATURAL-WINDOWS            L      /* Set window sizes
    3 #PDAC-WINDOW-LENGTH              L      /* Set window line length
    3 #PDAC-WINDOW-COLUMN              L      /* Set window column height
    3 #PDAC-WINDOW-BASE                L      /* Set window base
    3 #PDAC-DEFINE-WINDOW              L      /* Generate DEFINE WINDOW
    2 #PDA-USER-AREA                   A  100 (1:40) /* Area for INPUT and der
  R 2 #PDA-USER-AREA                          /* REDEF. BEGIN : #PDA-USER-AREA
    3 RESET-STRUCTURE                         /* Use for reseting non-alpha
  *                                           /* fields in Clear Subprogram.
    4 #PDAX-DESCS                      A   55 (1:4) /* description
    4 #PDAX-USE-MSG-NR                 L
  *
  *   Modify screen 2
    4 #PDAX-PDA                        A    8 /* PDA with display info.
    4 #PDAX-FILE-NAME                  A   32 /* File name
    4 #PDAX-FIELD-NAME                 A   32 /* Field name
    4 #PDAX-MAP-NAME                   A    8 /* Input using map
    4 #PDAX-LINES-PER-SCREEN           N    3 /* Number of lines per screen
  *
  *   used to generate a
  *   DEFINE WINDOW statement.
    4 DEFINE-WINDOW-INFO
    5 #PDAX-WINDOW-SIZE                A    6 /* Window size
  R 5 #PDAX-WINDOW-SIZE                       /* REDEF. BEGIN : #PDAX-WINDOW-S
    6 #PDAX-WINDOW-SIZE-WIDTH          N    3 /* Window size width
    6 #PDAX-WINDOW-SIZE-HEIGHT         N    3 /* Window size height
    5 #PDAX-WINDOW-BASE                A    6 /* Window base
  R 5 #PDAX-WINDOW-BASE                       /* REDEF. BEGIN : #PDAX-WINDOW-B
    6 #PDAX-WINDOW-BASE-LINE           N    3 /* Window base line
    6 #PDAX-WINDOW-BASE-COLUMN         N    3 /* Window base column
    5 #PDAX-WINDOW-FRAME-OFF           L      /* Window frame off
    5 #PDAX-WINDOW-TITLE               A   65 /* Window title
    5 #PDAX-WINDOW-CONTROL-SCREEN      L      /* Window control screen on
    5 #PDAX-DEFINE-WINDOW              L      /* Use DEFINE WINDOW statement
    4 #PDA-FIELD-TYPE                  A    2 /* Field type:GR,PE,PC,MU,MC
  *                                           /* S(Structure), F(Single Field)
  *                                           /* R(REDEFINE)
    4 #PDA-FIELD-REDEFINED             L
```

```
    4 #PDA-LEVEL-NUMBER              N    1
    4 #PDA-FIELD-FORMAT              A    1
    4 #PDA-FIELD-LENGTH              N  3.1
  R 4 #PDA-FIELD-LENGTH
    5 #PDA-UNITS                     N    3
    5 #PDA-DECIMALS                  N    1
    4 #PDA-FROM-INDEX                N    5 (1:3)
    4 #PDA-THRU-INDEX                N    5 (1:3)
    4 #PDA-FIELD-RANK                N    1
    4 #PDA-FILE-CODE                 P    8 /* file code for security check
    4 #PDA-MAX-LINES                 N    5 /* Num. of occurrences for PE/MU
    4 #PDA-WFRAME                    A    1 /* Parameters for window setting
    4 #PDA-WLENGTH                   A    3
    4 #PDA-WCOLUMN                   A    3
    4 #PDA-WBASE                     A    7
```

The fields in the model PDA are described in the following sections.

#PDA-CONDITION-CODES

This field (format L/1:75) is an array of condition codes that allow you to define up to 75 logical conditions for each model. The field is usually redefined into separate logical variables, one for each condition variable used by the model code frames. The name of the logical condition variable in the PDA must be the same as the condition, with a #PDAC- prefix added.

When a module is generated, the condition values are checked to determine whether the condition is true. The conditions are reset before the maintenance subprograms are invoked. Along with the pre-generation subprogram, the maintenance subprograms assign all true condition values.

Note: To make nested code frames more reusable across multiple models, it is important to use exactly the same naming conventions. In this way, the nested code frame substitution parameters and logicals are always available to the model PDAs.

#PDA-USER-AREA

This field (format A100/1:40) defines a large block of data that is passed between the Natural Construct nucleus and the model subprograms. Always redefine this field into separate fields that refer to the module being generated. The following information can be passed:

- Data entered by the developer on a maintenance panel. The names of the fields that receive the parameters should be prefixed by #PDAX- and appear first in the redefinition of #PDA-USER-AREA. Usually, the values for these fields are written as comments at the beginning of the generated program. This allows Natural Construct to read the parameters for subsequent regeneration.
- You can also group a series of related parameters into a single external parameter by redefining the #PDAX- variable into sub-fields. This technique reduces the number of comment lines at the beginning of a generated program.

Note: This technique should only be used when the length of the sub-fields does not change.

- Data calculated during the generation process and shared with the model subprograms. The variable names should be prefixed by #PDA- and appear second in the redefinition of #PDA-USER-AREA (after the #PDAX- variables).
- The pre-generation subprogram assigns these internal generation variables; all subsequent code frame and model subprograms can use the values.
- When you use substitution parameters in code frames, a variable with the same name and a #PDAX- or #PDA- prefix should be in the redefinition of the #PDA-USER-AREA variable. For example, the &MAX-SELECTIONS substitution parameter value should be supplied by the #PDA-MAX-SELECTIONS variable or the #PDAX-MAX-SELECTIONS variable.

Note: To make nested code frames more reusable across multiple models, it is important to use exactly the same naming conventions. In this way, the nested code frame substitution parameters and logicals are always available to the model PDAs.

CU—PDA

The following example shows the CU—PDA data area:

```
Parameter CU—PDA   Library SYSCST                             DBID  19 FNR  28
Command                                                                     > +
I T L Name                             F Leng Index/Init/EM/Name/Comment
Top - -------------------------------- - ---- ---------------------------------
    *   Parameters used by all user
    *   subprograms
    *
      1 CU—PDA
    *
    *   Parameters used by generating
    *   subprograms
      2 #PDA-MODE                        A    2 /* R=Report,S=Struct,SD=Str data
      2 #PDA-OBJECT-TYPE                 A    1 /* P=Program,N=Subprogram,etc.
    *
    *
    *   Parms used by modify screens
      2 #PDA-MODIFY-HEADER1              A   60 /* First heading on modify scr
      2 #PDA-MODIFY-HEADER2              A   54 /* Second heading on modify scr
      2 #PDA-LEFT-PROMPT                 A   11 /* Date
    R 2 #PDA-LEFT-PROMPT
      3 #PDA-LEFT-MORE-PROMPT            A    9
      2 #PDA-RIGHT-PROMPT                A   11 /* n of n
    R 2 #PDA-RIGHT-PROMPT
      3 #PDA-RIGHT-MORE-PROMPT           A    9
      2 #PDA-PHASE                       A    1 /* Modify, Generate, Clear etc.
      2 #PDA-DIALOG-METHOD               I    1 /* See CSLMMETH
    *                                           /* 1 = Input + Validate
    *                                           /* 2 = Input no validate
    *                                           /* 3 = Validate no input
    *                                           /* 4 = Validate input on error
      2 #PDA-TRANSLATION-MODE            L      /* Translation mode
    *
    *   The following PF key variables          are only required if the modify
    *   or sample program requires the          use of additional PF keys other
    *   than the standard MAIN, RETURN,         QUIT, HELP keys.
    *
    *   Place the following key names at        the bottom of map instead of
    *   using the KD option. The modify         program should reset the keys
    *   that are not being used or              assign the available key names
    *   to set additional keys.
    *
      2 #PDA-USERX-NAME                  A   10 /* User Exit name.
      2 #PDA-PF-NAME                     A   10 (1:12)
    R 2 #PDA-PF-NAME                             /* REDEF. BEGIN : #PDA-PF-NAME
      3 #PDA-MAIN-NAME                   A   10 /* Main menu key name.
      3 #PDA-RETURN-NAME                 A   10 /* Return key name.
      3 #PDA-QUIT-NAME                   A   10 /* Quit key name.
      3 #PDA-TEST-NAME                   A   10 /* Test key name.
      3 #PDA-BACKWARD-NAME               A   10 /* Bkwrd key name.
      3 #PDA-FORWARD-NAME                A   10 /* Frwrd key name.
      3 #PDA-LEFT-NAME                   A   10 /* Left key name.
      3 #PDA-RIGHT-NAME                  A   10 /* Right key name.
```

```
  3 #PDA-HELP-NAME                  A   10 /* Help key name.
  3 #PDA-AVAILABLE1-NAME            A   10 /* Not used by default.
  3 #PDA-AVAILABLE2-NAME            A   10 /* Not used by default.
  3 #PDA-AVAILABLE3-NAME            A   10 /* Not used by default.
*
*   This array contains the PF-KEY          number associated with each
*   standard key setting as well as         the numbers of the available
*   numbers for non-standard key            use.
  2 #PDA-PF-NUMBER                  N    2 (1:12)
R 2 #PDA-PF-NUMBER                          /* REDEF. BEGIN : #PDA-PF-NUMBER
  3 #PDA-MAIN                       N    2 /* Main menu key number.
  3 #PDA-RETURN                     N    2 /* Return key number.
  3 #PDA-QUIT                       N    2 /* Quit key number.
  3 #PDA-TEST                       N    2 /* Test key number.
  3 #PDA-BACKWARD                   N    2 /* Bkwrd key number.
  3 #PDA-FORWARD                    N    2 /* Frwrd key number.
  3 #PDA-LEFT                       N    2 /* Left key number.
  3 #PDA-RIGHT                      N    2 /* Right key number.
  3 #PDA-HELP                       N    2 /* Help key number.
  3 #PDA-AVAILABLE1                 N    2 /* Not used by default.
  3 #PDA-AVAILABLE2                 N    2 /* Not used by default.
  3 #PDA-AVAILABLE3                 N    2 /* Not used by default.
*
*   This array corresponds to the           above array except the 'PF'
*   'PF' string prefixes the key            for easy comparison to *PF-KEY.
  2 #PDA-PF-KEY                     A    4 (1:12)
R 2 #PDA-PF-KEY                            /* REDEF. BEGIN : #PDA-PF-KEY
  3 #PDA-PF-MAIN                    A    4 /* PFnn where nn = main key.
  3 #PDA-PF-RETURN                  A    4
  3 #PDA-PF-QUIT                    A    4
  3 #PDA-PF-TEST                    A    4
  3 #PDA-PF-BACKWARD                A    4
  3 #PDA-PF-FORWARD                 A    4
  3 #PDA-PF-LEFT                    A    4
  3 #PDA-PF-RIGHT                   A    4
  3 #PDA-PF-HELP                    A    4
  3 #PDA-PF-AVAILABLE1              A    4 /* Not used by default.
  2 #PDA-CV3                        C      /* Special characters in T mode
  2 #PDA-CV4                        C      /* Column headings in T mode
  2 #PDA-CV5                        C      /* CV 5
  2 #PDA-CV6                        C      /* CV 6
  2 #PDA-CV7                        C      /* CV 7
  2 #PDA-CV8                        C      /* CV 8
  2 #PDA-SCROLL-INDICATOR           A    4 /* Scroll region indicator
*
*   Dynamic attribute characters
*   from the control record. The
*   following index values represent
*   1=Default, 2=Intensify, 3=Blink,        4=Italics, 5=Underline,
*   6=Reversed, 7=Blue, 8=Green,            9=White, 10=Pink, 11=Red,
*   12=Turquoise, 13=Yellow.
  2 #PDA-DYNAMIC-ATTR-CHARS         A    1 (1:13)
*
*   Passed parameter from code frame
  2 #PDA-CV6                        C      /* CV 6
  2 #PDA-CV7                        C      /* CV 7
  2 #PDA-CV8                        C      /* CV 8
  2 #PDA-SCROLL-INDICATOR           A    4 /* Scroll region indicator
```

```
 *
 *   Dynamic attribute characters
 *   from the control record. The
 *   following index values represent
 *   1=Default, 2=Intensify, 3=Blink,        4=Italics, 5=Underline,
 *   6=Reversed, 7=Blue, 8=Green,           9=White, 10=Pink, 11=Red,
 *   12=Turquoise, 13=Yellow.
   2 #PDA-DYNAMIC-ATTR-CHARS          A    1 (1:13)
 *
 *   Passed parameter from code frame
  2 #PDA-FRAME-PARM                  A   32
  2 #PDA-SYSTEM                      A   32 /* System must exist in dict.
*
```

CU—PDA contains the fields described in the following sections.

#PDA-MODE

This field (format A2) identifies the programming mode. The value for this field is the programming mode specified on the Maintain Models panel. Valid values for this field are S (structured), SD (structured data), and R (reporting) mode.

#PDA-OBJECT-TYPE

This field (format A1) identifies the type of module generated. The value for this field is the module type specified on the Maintain Models panel. This field is useful when a model subprogram is associated with multiple models that use different module types. In this case, the presence or format of certain generated code may be dependent on the type of module generated.

#PDA-MODIFY-HEADER1

This field (format A60) contains the description specified on the Maintain Models panel. The maintenance input panels now use the variable #HEADER1 instead of #PDA-MODIFY-HEADER1. If the variable #HEADER1 has not been assigned a value, it will be assigned the contents contained in #PDA-MODIFY-HEADER1.

#PDA-MODIFY-HEADER2

This field (format A54) contains the description specified on the Maintain Models panel. The maintenance input panels now use the variable #HEADER2 instead of #PDA-MODIFY-HEADER2. If the variable #HEADER2 has not been assigned a value, it will be assigned the contents contained in #PDA-MODIFY-HEADER2.

#PDA-LEFT-PROMPT

This field (format A11) is redefined into the #PDA-LEFT-MORE-PROMPT field (format A9). The #PDA-LEFT-MORE-PROMPT field indicates the current date. You place this field as an output field in the top left corner of all maintenance panels. (If you require more than nine bytes, you can use the full length of A11.)

#PDA-RIGHT-PROMPT

This field (format A11) is redefined into the #PDA-RIGHT-MORE-PROMPT field (format A9). The #PDA-RIGHT-MORE-PROMPT field indicates the current panel and the total number of panels (1 of 4, for example) Place this field as an output field in the top right corner of all maintenance panels. (If you require more than nine bytes, you can use the full length of A11.)

#PDA-PHASE

This field (A1 format) identifies the current phase of the Natural Construct nucleus (see the CSLPhase data area for an example). Valid values for this field are A (post-generation), B (batch), C (clear), D (default), G (generation), L (translate), M (maintenance), P (pre-generation), R (read), U (sample user exit), and V (save). The value for this field is typically controlled by the Natural Construct nucleus and should not be manipulated locally.

Note: Maintenance subprograms are also invoked prior to SAMPLE processing in the User Exit editor (in which case, the phase is U) and prior to the generation phase (in which case, the phase is G).

Since some subprograms are invoked during more than one phase, this field activates the subprogram logic for the current phase. For example, the maintenance subprograms performed during the maintenance phase (M) are invoked (with data stacked) during the generation (G) and sample user exit (U) phases. It may be inappropriate for the maintenance subprogram to perform certain processing during any of these phases.

#PDA-DIALOG-METHOD

This field (format I1) is reserved for future use.

#PDA-TRANSLATION-MODE

This field (format L) is reserved for future use.

#PDA-USERX-NAME

This field (format A10) is for internal use only.

#PDA-PF-NAME

This field (format A10/1:12) is an array containing the names of the standard PF-keys and is redefined into the following fields (format A10):

Field	Description
#PDA-MAIN-NAME	Main menu key name.
#PDA-RETURN-NAME	Return key name.
#PDA-QUIT-NAME	Quit key name.
#PDA-TEST-NAME	Test key name.
#PDA-BACKWARD-NAME	Backward key name.
#PDA-FORWARD-NAME	Forward key name.
#PDA-LEFT-NAME	Left key name.
#PDA-RIGHT-NAME	Right key name.
#PDA-HELP-NAME	Help key name.
#PDA-AVAILABLE1-NAME	Not used, by default.
#PDA-AVAILABLE2-NAME	Not used, by default.
#PDA-AVAILABLE3-NAME	Not used, by default.

The names are in the same order as the key settings specified on the Natural Construct Control record. The name for PF1 is stored in the first position, PF2 is stored in the second position, etc.

You can define special PF-keys for maintenance subprograms (or sample generation subprograms) by specifying the desired PF-key values and names on the Maintain Subprograms panel (S function on the Administration main menu).

Occasionally, a subprogram may need to modify its PF-key assignments based on internal program functions and parameter values. If this is the case, place this array of PF-key names on the model panels and set the appropriate PF-key names (assuming your model supports variable PF-keys).

If a subprogram requires PF-keys for non-standard functions that are not known at compile time, display this array on the map (instead of using the SET KEY statement and the KD option of the FORMAT statement).

#PDA-PF-NUMBER

This field (format N2/1:12) is an array containing the PF-keys that support the standard PF-key functions and is redefined into the following fields (format N2):

Field	Description
#PDA-MAIN	Main menu key number.
#PDA-RETURN	Return key number.
#PDA-QUIT	Quit key number.
#PDA-TEST	Test key number.
#PDA-BACKWARD	Backward key number.
#PDA-FORWARD	Forward key number.
#PDA-LEFT	Left key number.
#PDA-RIGHT	Right key number.
#PDA-HELP	Help key number.
#PDA-AVAILABLE1	Not used, by default.
#PDA-AVAILABLE2	Not used, by default.
#PDA-AVAILABLE3	Not used, by default.

The values in this array assign a PF-key function to a PF-key number (for indexing on the #PDA-PF-NAME table). The first occurrence contains the PF-key number associated with the "main" function, the second occurrence contains the PF-key number associated with the "return" function, etc.

To include additional PF-keys, use the PF-key corresponding to the numbers assigned to #PDA-AVAILABLE1 through #PDA-AVAILABLE3.

#PDA-PF-KEY

This field (format A4) is an array corresponding to the #PDA-PF-NUMBER array (see the previous section) except the values have a PF- prefix. This makes it easy to compare the value of a *PF-KEY system variable to one of the following fields (format A4):

Field	Description
#PDA-PF-MAIN	PF*nn*, where *nn* is the main menu key number.
#PDA-PF-RETURN	PF*nn*, where *nn* is the return key number.
#PDA-PF-QUIT	PF*nn*, where *nn* is the quit key number.
#PDA-PF-TEST	PF*nn*, where *nn* is the test key number.
#PDA-PF-BACKWARD	PF*nn*, where *nn* is the backward key number.
#PDA-PF-FORWARD	PF*nn*, where *nn* is the forward key number.
#PDA-PF-LEFT	PF*nn*, where *nn* is the left key number.
#PDA-PF-RIGHT	PF*nn*, where *nn* is the right key number.
#PDA-PF-HELP	PF*nn*, where *nn* is the help key number.
#PDA-PF-AVAILABLE1	Not used (by default).
#PDA-PF-AVAILABLE2	Not used (by default).
#PDA-PF-AVAILABLE3	Not used (by default).

Note: The PF-key variables defined in this PDA allow your models to automatically use the PF-key values and names specified on the Natural Construct Control record. If you do not require this flexibility, you can use hardcoded PF-key values and names.

#PDA-TITLE

This field (format A25) contains the title of the module that is generated, which is required for the generation process. The title is used to identify the module for the List Generated Modules function on the Generation main menu. You can place this field on the model maintenance panels.

#PDA-GEN-PROGRAM

This field (format A8) contains the name of the module that is generated, read, or saved. The value for this field is the module name specified on the Generation main menu. You can place this field on the first maintenance panel for the model.

#PDA-MODEL-VERSION

This field (format N2.2) contains the number of the Natural Construct version used to generate the model.

#PDA-HELP-INDICATOR

This field (format A4) contains the help indicator for maps. The value for this field is the help indicator specified on the Control record (an asterisk (*), for example).

#PDA-USER-DEFINED-AREA

This field (format A1/1:100) is available to the user.

#PDA-UNDERSCORE-LINE

This field (format A80) contains the 1- to 4-character set used to create the underscore line for text on maps. The specified set is repeated until all spaces are filled (80, by default). The value for this field is the underscore character set specified on the Natural Construct Control record. For example, if "----" is specified, the underscore line is:

```
----------------------------------------------------------------------
```

Or if "++" is specified, the underscore line is:

```
++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++  ++
```

#PDA-RIGHT-PROMPT-OF

This field (format A4) contains the text used in the right prompt for maps. The value for this field is the "of" indicator specified on the Natural Construct Control record ("1" of "4", for example).

#PDA-DISPLAY-INDICATOR

This field (format A4/1:10) is an array corresponding to the position indicators used on maps. The values for this field are the position indicators specified on the Natural Construct Control record ("1, 2, 3...", for example).

#PDA-CURS-FIELD

This field (format I4) contains the cursor position for dynamic translation on maps.

#PDA-CV*n*

These fields (format C) are control variables (#PDA-CV1 through #PDA-CV8) used on maps to dynamically control the text displayed on a panel. These control variables are:

Control Variable	Description
#PDA-CV1	Controls field prompts.
#PDA-CV2	Controls prompt headings.
#PDA-CV3	Controls special characters.
#PDA-CV4	Controls column headings.
#PDA-CV5	Not currently used.
#PDA-CV6	Not currently used.
#PDA-CV7	Not currently used.
#PDA-CV8	Not currently used.

#PDA-SCROLL-INDICATOR

This field (format A4) contains the scroll region indicator(s) used on maps. The value for this field is the character(s) specified on the Natural Construct Control record (“>>”, for example).

#PDA-DYNAMIC-ATTR-CHARS

This field (format A1/1:13) is an array containing the default dynamic attribute characters. The values for this array are the dynamic attributes specified on the Natural Construct Control record. Dynamic attribute characters allow the developer to embed special characters within text that change how the text is displayed.

These dynamic attribute characters correspond to the following index occurrences:

Attribute	Index Occurrence
Default return	01
Intensify	02
Blinking	03
Italics	04
Underline	05
Reverse video	06
Blue	07
Green	08
White	09
Pink	10
Red	11
Turquoise	12
Yellow	13

The CSUDYNAT subprogram uses these settings for the Natural dynamic attribute parameter (DY=). For a description of CSUDYNAT, see **CSUDYNAT Subprogram**, page 393.

#PDA-FRAME-PARM

This field (format A32) contains different values depending on the type of subprogram. The Natural Construct nucleus can set this field before the code frame subprograms are invoked; this field is always set before the sample user exit subprograms are invoked.

For code frame generation subprograms, this field contains the value of the constant literal entered in the subprogram line in the code frame (next to the Parameter prompt). For sample user exit subprograms, this field contains the name of the user exit for which the sample was invoked.

#PDA-SYSTEM

This field (format A32) contains the default system name when Predict program entries are generated from within Natural Construct. (Programmers/analysts can document generated modules in Predict by pressing the optns PF-key on the Generation main menu before saving or stowing the module.) Place this field on the first maintenance panel for the model.

Any supplied model that generates a dialog also uses this field as part of the key to access help information. The system value corresponds to the Major component of the help key.

CSASTD PDA

CSASTD PDA contains the fields described in the following sections.

Note: The CSASTD PDA is used by every model. It passes messages between subprograms and is typically used for error handling.

MSG

This field (format A79) is used with the RETURN-CODE field (see **RETURN-CODE**, page 162). It is used to pass messages between the Natural Construct nucleus and the model subprograms. It should be displayed on the message line of all maintenance panels and reset after all inputs.

MSG-NR

This field (format N4) is not currently used.

MSG-DATA

This field (format A32/1:3) contains the values for embedded substitution strings. If a message contains the :1:, :2:, or :3: substitution strings, you can supply values to these strings in MSG-DATA(1), MSG-DATA(2), and MSG-DATA(3), respectively.

RETURN-CODE

This field (format A1) is used with the MSG field (see **MSG**, page 161). When a module is generated, the model subprograms or related code frame subprograms may encounter problems. When this happens, the subprogram should assign the RETURN-CODE field before returning to the Natural Construct nucleus. It should also assign an error message to the MSG field.

If the value assigned to the RETURN-CODE field is blank (informational message) or W (warning message), a warning is issued by Natural Construct and a message is displayed in the Status window. The developer can either ignore the warning and continue the generation process or terminate generation.

If the value assigned to the RETURN-CODE field is C (communication error) or E (error), the error message is displayed but the developer cannot continue the generation process.

The CSLRCODE local data area contains valid return codes for the RETURN-CODE field.

ERROR-FIELD

This field (format A32) identifies a field in error. The field name is displayed with the error message.

ERROR-FIELD-INDEX1/2/3

These fields (format P3) identify occurrences of fields in error. If the error field is an element of an array, they identify the specific occurrence of the field in error.

Step 7: Create the Translation LDAs and Maintenance Maps

After defining the parameters and creating the parameter data area (PDA) for the model, if needed create the translation LDAs to support multilingual specification panels and the maintenance maps (panels) to accept parameters from the developer. These procedures are described in the following sections.

Translation LDAs

To support multilingual text and messages, each maintenance panel can use up to five translation local data areas (LDAs). These LDAs contain the names of the fields that can be translated. You cannot display a panel in another language unless the module that invokes the panel has a corresponding translation LDA.

All translation LDAs must have following format:

```
Local     CUBAMAL   Library SYSCST                            DBID  18 FNR   4
Command                                                                    > +
 I T L Name                             F Leng Index/Init/EM/Name/Comment
 All - -------------------------------- - ---- ---------------------------------
   * * **SAG TRANSLATION LDA
   * * * used by map CUBAMA0.
     1 CUBAMAL
     2 TEXT                                    /* Corresponds to syserr message
     3 #GEN-PROGRAM                     A   20 INIT<'*2000.1,.'>
     3 #SYSTEM                          A   20 INIT<'*2000.2,.'>
     3 #GDA                             A   20 INIT<'*2000.3,.'>
     3 #TITLE                           A   20 INIT<'*2001.1,.'>
     3 #DESCRIPTION                     A   20 INIT<'*2001.2,.'>
     3 #GDA-BLOCK                       A   20 INIT<'*2001.3,.'>
   R 2 TEXT
     3 TRANSLATION-TEXT
     4 TEXT-ARRAY                       A    1 (1:120)
     2 ADDITIONAL-PARMS
     3 #MESSAGE-LIBRARY                 A    8 INIT<'CSTLDA'>
     3 #LDA-NAME                        A    8 INIT<'CUBAMAL'>
     3 #TEXT-REQUIRED                   L      INIT<TRUE>
    3 #LENGTH-OVERRIDE            I   4 /* Explicit length to translate
```

CUBAMAL Translation LDA for the Batch Model

In this example, the fields in CUBAMAL correspond to the following fields on the Standard Parameters panel for the Batch model:

Field Name in LDA	Field Name on Panel
#GEN-PROGRAM	Module
#SYSTEM	System
#GDA	Global data area
#TITLE	Title
#DESCRIPTION	Description
#GDA-BLOCK	With block

When naming your translation LDAs, we recommend using the name of the module that uses the LDA and adding an "L" in the last position. For example, the CUBAMA maintenance subprogram uses the CUBAMAL translation LDA.

The sum of the lengths of all fields in the translation LDA must match the length of the text array. In the CUBAMAL example, each of the six fields has a length of 20 and the text array is 1:120 (6 x 20).

To support multilingual specification panels, use SYSERR numbers to assign the INIT values for the translation LDA fields. The translation LDAs are passed through the CSUTRANS utility, which expects the structure on the previous page. CSUTRANS also expects the SYSERR INIT values in the following format:

Position	Format
Byte 1	Must be an asterisk (*).
Bytes 2–5	Must be numeric and represent a valid SYSERR number. The first five bytes are mandatory (bytes 1–5); these values are used to retrieve the text associated with the corresponding SYSERR number and the current value of the *Language Natural system variable. If the text for the current language is not available, CSUTRANS follows a modifiable hierarchy of *Language values until text is retrieved (you can define this hierarchy in the DEFAULT-LANGUAGE field within the CNAMSG local data area). As the original development language, English (*Language 1) should always be available. **Note:** CSUTRANS does not perform any substitutions (using :1::2::3:). To perform substitutions, you must call the CNUMSG subprogram.
Byte 6	Can be a period (.), which indicates that the next byte is a valid position value.

Position	Format (continued)
Byte 7	Can be a position value. Valid values are 1 to 9, A (byte 10), B (byte 11), C (byte 12), D (byte 13), E (byte 14), F (byte 15), and G (byte 16). For example, *2000.2 identifies the text for SYSERR number 2000, position 2 (as delimited by a / in SYSERR). If the message for SYSERR number 2000 is Module/System/Global data area, only System is retrieved. If you reference the same SYSERR number more than once in a translation LDA, define the INIT values on consecutive lines to reduce the number of calls to SYSERR; the position values for a SYSERR number can be referenced in any order. To minimize confusion, we recommend you use the *.n* notation even when there is only one message for the SYSERR number.
Byte 8	Can be a comma (,), which indicates that the next byte or bytes contain special format characters. Values specified before the comma (,) indicate what text to retrieve; values specified after the comma indicate how the text is displayed. **Note:** Although you can use a comma in byte 6 (instead of a period), we recommend that you always use the .n position indicator in bytes 6 and 7.
Byte 9	After the comma, can be one of the following: . Indicates that the first position after the field name is blank and the remainder of the field prompt is filled with periods (Module name ....:, for example). + Indicates that the text is centered using the specified field length override (see description of Byte 10). If you do not specify the override length, Natural Construct uses the actual field length. < Indicates that the text is left justified (this is the default). > Indicates that the text is right justified.

Position	Format (continued)
/	Indicates that a length override value follows.
Bytes 10–16	After the / override length indicator (see above), indicates the actual override length in bytes.

Note: For more information about referencing SYSERR numbers, refer to **Using SYSERR References**, page 496**.**

If you want to use the override length notation (*0200.4,+/6, for example) and the LDA field is too small (A6, for example), you can define a larger field (A12, for example), redefine it using a shorter display value, and then use the override length notation. For example:

```
01  FIELD-NAME              A1  INIT<'*0200.4+/6'>
01  Redefine #FIELD-NAME
    02  #SHORT-FIELD-NAME   A6
```

Maintenance Maps

Normally, each maintenance subprogram is associated with a different maintenance map. You can use a layout map as a starting layout for your maintenance maps and then list the model PDA fields in the Map editor and select the desired fields. For a standard maintenance map, use the CDLAY layout map. For a multilingual maintenance map, you can also use the CDLAY layout map and remove all text except the lines containing the first and second headings. (For an example of a multilingual maintenance map, see the CU--MA0 map in the SYSCST library.)

You can also use the Natural Construct Map model to create your maintenance maps. For a description of the Map model, see the applicable chapter of *Natural Construct Generation User's Manual*.

Step 8: Create the Model Subprograms

You can use the supplied models to generate the subprograms described in this step. For a detailed description of a particular model, refer to the applicable chapter in this manual. Chapters 5 to 14 describe the model generation models in the order they are implemented during the generation process.

Maintenance Subprograms

Generated using the CST-Modify model, these subprograms receive the specification parameters (#PDAX variables in the model PDA) from the developer and should ensure that the parameters are valid. These subprograms can also set condition codes and assign derived PDA variables.

Maintenance subprograms are executed in the same order as they appear on the Maintain Models panel. Usually, there is one maintenance subprogram for every left/right (horizontal) maintenance panel. Data edits should only be applied if the developer presses Enter or PF11 (right). Either the maintenance subprogram or the maintenance map can validate the parameters.

You should only trap PF-keys that perform specialized functions related to the panel. If you want the PF-key settings to be dependent on the default settings specified on the Control record, the subprogram should not contain hardcoded PF-keys (check the PF-key values using the variables specified in CU—PDA).

Note: You can define special PF-keys and window settings for each maintenance subprogram (see **Maintain Subprograms Function**, page 61).

Note: A maintenance subprogram can test the value of CU—PDA.#PDA-PHASE to identify the phase during which it was invoked.

For an example of a generated maintenance subprogram, see the CUMNMA and CUMNMB subprograms in the SYSCST library.

For information about the CST-Modify model, see **CST-Modify Model**, page 239.

When are Maintenance Subprograms Invoked?

The Natural Construct nucleus invokes the maintenance subprograms in the following situations:

Generation Main Menu

Function: M Module: TEST Panel: 2

Invokes the second maintenance panel, and:

- If the developer presses Enter, invokes the Generation main menu.
- If the developer presses PF11 (right), invokes the third panel (if there is one).
- If the developer presses PF10 (left), invokes the first panel and displays the message: Beginning of specification panels.

Function: M Module: TEST Panel:

Invokes the first maintenance panel, and:

- If the developer presses Enter or PF11 (right), invokes the second panel (if there is one).
- If the developer presses PF10 (left), invokes the first panel and displays the message: Beginning of specification panels.

Function: G Module: TEST Panel:

Invokes all maintenance panels to ensure that all parameters have been edited before generation. The input panels are not displayed unless an error is encountered.

User Exit Editor

> SAMPLE

Invokes all maintenance panels so you can ensure that all parameters have been edited before generation. The input panels are not displayed unless an error is encountered.

Pre-generation Subprogram

Generated using the CST-Pregen model, this subprogram is invoked either after all maintenance subprograms are executed during the generation phase or after the SAMPLE command is issued from the User Exit editor. It is the first user subprogram invoked. It assigns all true condition values (see the following example), based on user-supplied input parameters or other calculated values. (All #PDAC-condition values are reset before the generation process is started.)

This subprogram should also calculate the values of any #PDA variables required by subsequent generation subprograms. For simple models that do not have code frames, this subprogram can also perform the functions of a generation subprogram. (Condition code values and derived fields can also be assigned within the maintenance subprograms.)

For an example of a generated pre-generation subprogram, see the CUMNPR subprogram in the SYSCST library.

For more information about the CST-Pregen model, see **Parameters for the CST-Pregen Model**, page 259.

Generation Subprograms

Because the lengths and contents of certain code frame parameters change based on user-supplied input values or information in Predict, these parameters must be supplied by the generation subprograms. These subprograms write statements to the Natural edit buffer, based on user-supplied input parameters or other calculated values.

To write to the edit buffer, include a DEFINE PRINTER(SRC=1) OUTPUT 'SOURCE' statement in the subprogram that routes the output to the source work area. To allow models to be ported to multiple platforms, use the CU--DFPR copycode member to define the SRC printer.

All WRITE (SRC), DISPLAY (SRC), and PRINT (SRC) statement output for your print file is written to the edit buffer. Use the NOTITLE option on each of these statements. If a DISPLAY statement is used in the subprogram, also use the NOHDR option. When trailing blanks should be suppressed in variable names, the PRINT statement can be a useful alternative to the WRITE statement. However, you may want to increase the line length of the edit buffer when using the PRINT statement, so variable names are not split at the - character.

Because generation logic can be highly complex, these subprograms allow ultimate flexibility. However, they are less maintainable than code frame statements since you must change Natural programs to modify the generated code.

Generation subprograms can also accept the #PDA-FRAME-PARM constant code frame parameter in CU—PDA. This parameter allows a subprogram to be invoked several times within the generation process. Each time the generation subprogram is invoked, it can use the value of this parameter to determine what to generate.

You can invoke the generation subprograms by specifying line type N in the T (type) column in the Code Frame editor. You can also specify the constant parameter value on this line.

The following example of the Code Frame editor displays the code frame in which the CUMYGVAR subprogram is invoked. The DEFINE and INIT parameters are passed to this subprogram:

```
Frame ..............GENSUBP                                           SIZE 172
Description ........Example of generation subprogram                   FREE 36572
>                                            > + ABS X X-Y _ S 21   L 1
  ....+....1....+....2....+....3....+....4....+....5....+....6....+....7..T C
Subprogram: CUMYGVAR Parameter: DEFINE                   N
     .
     .
     .
Subprogram: CUMYGVAR Parameter: INIT                     N
```

Example of a Generation Subprogram in a Code Frame

Example of a Generation Subprogram

For an example of a generated generation subprogram, see the CUMNGGL subprogram in the SYSCST library.

Post-generation Subprogram

Generated using the CST-Postgen model, this subprogram provides the values for the substitution parameters in the code frames identified by an ampersand (&). When the developer enters G on the Generation main menu, this subprogram is invoked as the final stage of the generation process.

During the generation process, code lines specified in the code frame are written to the edit buffer, as well as the output of the generation subprogram contained in the code frame. Substitution parameters are included in the edit buffer exactly as they appear in the code frame. After this phase of the process, the content of the edit buffer can be the following:

```
>                                     > + Program     : ABCSUBS  Lib: CSTDEV
All    ....+....1....+....2....+....3....+....4....+....5....+....6....+....7..
  0010 DEFINE DATA LOCAL
  0020   01 #MAX-LINES(P3) CONST<&MAX-SELECTIONS>
  0030   01 #LINE-NR(P3/1:#MAX-LINES)
  0040   01 #I(P3)
  0050 END-DEFINE
  0060 FOR #I = 1 TO #MAX-LINES
  0070   ASSIGN #LINE-NR(#I) = #I
  0080 END-FOR
  0090 .
  0100 .
  0110
  0120
  0130
  0140
  0150
  0160
  0170
  0180
  0190
  0200
       ....+....1....+....2....+....3....+....4....+....5....+... S 10   L 1
```

Example of Edit Buffer After the Generate Object Phase

The post-generation subprogram substitutes the code frame parameters with the corresponding substitution values by stacking the substitution parameters and their corresponding values. Use the STACK TOP DATA FORMATTED statement to stack these values (see the example on the following page).

Example of a post-generation subprogram

```
DEFINE DATA
  PARAMETER USING CUMYPDA
  PARAMETER USING CU—PDA
  PARAMETER USING CSASTD
END-DEFINE
**
** Stack change commands
STACK TOP DATA FORMATTED '&KEY' #PDAX-KEY
STACK TOP DATA FORMATTED '&KEY-FORMAT' #PDA-KEY-FORMAT
END
```

- #PDAX-KEY must contain the &KEY substitution parameter value.
- #PDA-KEY-FORMAT must contain the &KEY-FORMAT substitution parameter value.

Stack Order of Substitution Parameters

Stacked parameters build a series of CHANGE commands that are applied by the nucleus after the post-generation subprogram is finished executing. To change the substitution variables embedded within a longer string, these CHANGE commands use the ABS (Absolute) option. If one substitution variable is a substring of another substitution variable, stack the longer substitution variable last. Since the STACK TOP option supplies the substitution values, the changes to the longer substitution value are applied first.

Example of the STACK TOP option

```
STACK TOP DATA FORMATTED '&KEY' #PDAX-KEY
STACK TOP DATA FORMATTED '&KEY-FORMAT' #PDA-KEY-FORMAT
```

Blanks versus Nulls

By default, the substitution parameter is replaced by one blank character if the second parameter (the substituted value) is blank. If you want to replace a blank substitution value with a null string, use the following notation:

```
STACK TOP DATA FORMATTED '&FILE-PREFIX' #PDA-FILE-PREFIX 'NULL'
```

Clear Subprogram

Generated using the CST-Clear model, this subprogram resets the #PDA-USER-AREA variables in the model PDA. Only non-alphanumeric variables are reset. The clear subprogram can also assign initial default values for user parameters.

If you do not specify a clear subprogram, the Clear function on the Generation main menu sets #PDA-USER-AREA to blanks. The edit buffer is always cleared, regardless of whether the model uses a clear subprogram.

When are Clear Subprograms Invoked?

The Natural Construct nucleus invokes the clear subprogram in the following situations:

- When the developer invokes the Clear Edit Buffer function on the Generation main menu.
- When the developer changes the model name and the new model uses a different PDA.
- Immediately before the Read Specifications function is executed on the Generation main menu.

Example of a clear subprogram

```
DEFINE DATA
  PARAMETER USING CUMYPDA
  PARAMETER USING CU—PDA
  PARAMETER USING CSASTD
END-DEFINE
**
**Initialize non-alpha fields and set default values.
RESET #PDAX-MAX-PANELS #PDA-KEY-LENGTH
ASSIGN #PDAX-GDA = 'CDGDA'
ASSIGN #PDA-SYSTEM = *LIBRARY-ID
END
```

Save Subprogram

Generated using the CST-Save model, this subprogram writes the specification parameters to the edit buffer. To read a previously-generated program, the model must have both a save and a read subprogram. The save subprogram must contain a separate WRITE statement for each specification parameter (#PDAX variable). Use the equal (=) notation to include the variable name with the contents of the variables. For example:

```
WRITE(SRC) NOTITLE '=' #PDAX-variable-name
```

Note: Use a separate WRITE statement for each component of an array.

Example of a save subprogram

```
DEFINE DATA
  PARAMETER USING CUMYPDA
  PARAMETER USING CU—PDA
  PARAMETER USING CSASTD
  LOCAL
  01 #I(P3)
  01 #TEMP(A25)
END-DEFINE
**
DEFINE PRINTER (SRC=1) OUTPUT 'SOURCE'
FORMAT(SRC) LS=150
**
** Write out parameters to be saved.
WRITE(SRC) NOTITLE '=' #PDAX-GDA
WRITE(SRC) NOTITLE '=' #PDAX-MAIN-MENU-PROGRAM
WRITE(SRC) NOTITLE '=' #PDAX-QUIT-PROGRAM
FOR #I = 1 TO 4
  IF #PDAX-DESC(#I) NE ' ' THEN
    COMPRESS '#PDAX-DESC(' #I '):' TO #TEXT LEAVING NO
    PRINT(SRC) NOTITLE #TEXT #PDAX-DESC(#I)
  END-IF
END-FOR
END
```

Note: When compressing an index value that can be more than one digit in length, redefine a numeric index with an alpha string and compress the alpha string to preserve leading zeros.

Natural Construct changes the output of this subprogram to:

```
**SAG variable-name: variable contents
```

For example, Natural Construct changes

```
#PDAX-MAP-NAME: MYMAP
```

to

```
**SAG MAP-NAME: MYMAP
```

These lines are placed at the beginning of the generated module.

Read Subprogram

Generated using the CST-Read model, this subprogram reads the specification parameters from a previously-generated module. It contains a series of INPUT statements that accept the data previously placed in the Natural stack. The read subprogram is invoked when the developer invokes the Read Specifications function on the Generation main menu.

Before the read subprogram is invoked, all **SAG parameter values are placed on the Natural stack. The read subprogram repeats a series of INPUT statements to accept the stacked parameters and assign them to the correct PDA variables. This subprogram must correspond to the save subprogram that writes the **SAG parameter lines. The read subprogram can also read common parameters from a different model.

Note: Natural Construct invokes the clear subprogram before invoking the read subprogram. It is not necessary to save null parameter values.

Example of a Read Subprogram

For an example of a generated read subprogram, see the CUMNR subprogram in the SYSCST library.

Sample User Exit Subprograms

Generated using the CST-Frame model, these subprograms help the developer create user exit code by providing a starting sample. They can be simple or complicated, depending on the model. When creating a sample subprogram, you can include additional parameters to give the developer more control over what is generated into the user exit. To pass additional information to the sample subprogram, you can use the CU—PDA.#PDA-FRAME-PARM variable.

All maintenance subprograms and the pre-generation subprogram are automatically invoked before the sample subprograms are executed. This ensures that the current specification parameters are valid and the conditions are set.

To define a sample subprogram, enter .E at the beginning of a user exit line in the Code Frame editor. For more information, see **Add User Exit Points**, page 132.

Example of a Sample Subprogram

For an example of a generated sample subprogram, see the CUFMSRIN subprogram in the SYSCST library.

Document Subprogram

Generated using the CST-Document model, this subprogram creates an extended Predict description. To support the generation of a Predict extended description for the generated modules, you must create a document subprogram for your model. This subprogram creates a free-form description of the generated module using the information entered on the model specification panels. You can write information in any language for which you have translated help text members. For more information, see **Using SYSERR References for Multilingual Support**, page 493.

The document subprogram writes the model description to Predict when the developer turns this option on (using the optns PF-key on the Generation main menu) and invokes the Save or Stow function. The functions available on the Generation main menu are described in the *Natural Construct Generation User's Manual*.

Example of a Document Subprogram

For an example of a generated document subprogram, see the CUMND subprogram in the SYSCST library.

Testing the Model Subprograms

Because a model contains several components, it is often better to test each component individually, or test related subprograms, without the overhead of the Natural Construct nucleus. After you define the model PDA, maintenance maps, and subprograms, you can test the individual components of the model by issuing the CSUTEST command from the SYSCST library. This supplied utility invokes the Single Module Test Program panel:

```
CSUTEST                 ***** Natural Construct *****                CSUTESM1
Aug 01                  - SINGLE MODULE TEST PROGRAM -

Code Function             *Model: ______________________________
---- -------------------   Number all subprograms to be executed
 R   Release Variables      |                     |
 *   Execute All Subp.      V                     |
1-9  Execute One Subp.        Clear :            V
 E   Edit source              Mod  1:              Mod  6:
 C   Clear Edit Buffer        Mod  2:              Mod  7:
 ?   Help                     Mod  3:              Mod  8:
 .   Terminate                Mod  4:              Mod  9:
---- -------------------      Mod  5:              Mod 10:
 _                            Pregen:              Save  :
                Source        Documt:              Postgn:
                Lines
          Total:    0                            Frame Parameter or Exit Name
                           _  Other : ________ ______________________________
                           _  Other : ________ ______________________________
                           _  Other : ________ ______________________________
                           _  Other : ________ ______________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help        quit
```

Single Module Test Program Panel

A typical test invokes one or more maintenance subprograms (indicated by Mod *n*), the pre-generation subprogram, and a generation subprogram (in that order).

Note: The Single Module Test Program panel is a utility; it is not available in dynamic translation mode.

The fields on the Single Module Test Program panel are:

Field		Description
Code Function		Functions available through this panel and the codes that invoke each function. Enter the codes in the unnamed input field displayed below the Code field. Valid codes are:
	R	Resets the parameter data area (PDA) passed to all model subprograms.
	*	Executes all model subprograms. Subprograms marked with a number are executed in order from 1 to 9. Code generated into the edit buffer by a subprogram is delimited by comments containing the name of the subprogram.
	1–9	Executes the specified model subprogram. To execute a specific subprogram, enter a number from 1 to 9. If you enter 1, for example, all subprograms marked 1 are executed in the same order they are displayed on the panel.
	E	Invokes the appropriate Natural editor to edit source.
	C	Clears the edit buffer. You should clear the edit buffer before testing the next subprogram.
	?	Displays help for the panel.
	.	Terminates the Test utility and displays the Natural Next prompt (Direct Command box for Unix).

Field	Description (continued)
Model	To display the names of the subprograms associated with a model, enter the name of the model in this field. The following information is displayed:

```
CSUTEST                 ***** Natural Construct *****                CSUTESM1
 Aug 01                  - SINGLE MODULE TEST PROGRAM -

 Code Function             *Model: BROWSE-SELECT___________________
 ---- -------------------   Number all subprograms to be executed
  R   Release Variables     |                     |
  *   Execute All Subp.     V                     |
 1-9  Execute One Subp.     _  Clear : CUSLC      V
  E   Edit source           _  Mod  1: CUSCMA     _ Mod  6: CUSCMG
  C   Clear Edit Buffer     _  Mod  2: CUSLMB       Mod  7:
  ?   Help                  _  Mod  3: CUSCMC       Mod  8:
  .   Terminate             _  Mod  4: CUSLME       Mod  9:
 ---- -------------------   _  Mod  5: CUSLMF       Mod 10:
  _                         _  Pregen: CUSLPR     _ Save  : CUSCST
                Source      _  Documt: CUSLD      _ Postgn: CUSLPS
                Lines
          Total:    0                           Frame Parameter or Exit Name
                            _  Other : ________ _______________________________
                            _  Other : ________ _______________________________
                            _  Other : ________ _______________________________
                            _  Other : ________ _______________________________
 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
       help        quit
 New model definition read.
```

Single Module Test Program Panel — After Entering a Model Name

Enter a number beside each subprogram you want to execute and then enter the same number in the Code field.

Note: If the generation subprograms' test conditions and variables are set in the pre-generation or maintenance subprograms, invoke the pre-generation or maintenance subprograms first.

Field	Description (continued)
Frame Parameter or Exit Name	Names of up to four generation subprograms and the names of the corresponding code frame parameters or user exit that is passed to each subprogram when it is executed.
Source Lines Total	Total number of lines in the source buffer.

Debugging a Model

After you create all the components of a model, you can use several Natural Construct trace facilities to display information about the generation process. These trace facilities can help you debug your model.

➢ To invoke the trace facilities:

1 Enter the specifications for the model you want to test.

2 Press PF5 (optns).
The Optional Parameters window is displayed:

```
CSGOPTS            Natural Construct            CSGOPTS0
Oct 26            Optional Parameters            1 of 1
  Status window ................ _
                   Step ....... _
                   Text ....... _
  Embedded statements .......... _
  Condition codes .............. _
  Post-generation modifications  _
  Specifications only .......... _
  Document in Predict .......... _
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9-
      help  retrn quit
```

Optional Parameters Window

The fields in the Optional Parameters window are:

Field	Description
Status window	If this field is marked, the Status window is displayed during generation. Messages in this window indicate which module is executing at each stage of the generation process. The default for this field is determined by the value specified for the Status field on the Maintain Models panel (see **Maintain Models Function**, page 48).
Step	If this field is marked, you can “step” through the stages of the generation process by pressing Enter; the next message is not displayed until you press Enter. To have the generation process continue unaided, press PF2 (run).
Text	If this field is marked, messages are displayed as text (for example, “starting _” and “ending _”). If this field is not marked, messages are displayed with arrows “---> _” (starting) and “<--- _” (ending).
Embedded statements	If this field is marked, embedded statements are written to the source buffer as part of the generated module. These statements indicate where the code originated and the name of the code frame, generation subprogram, or sample subprogram that produced it.
Condition codes	If this field is marked, the Condition Codes window displays the values of the condition codes after the pre-generation subprogram executes.
Post-generation modifications	If this field is marked, the Post-Generation Modifications window displays the values of the code frame substitution parameters identified by an ampersand (&) during generation. The window is displayed after the post-generation subprogram stacks the substitution values in the code frame.

Field	Description (continued)
Specifications only	If this field is marked, only the current specifications and user exit code are saved. This function is helpful if parameter edits do not allow you to complete the generation process and you want to save the current specifications and user exit code.
Document in Predict	If this field is marked, the saved generated module (program, data area, etc.) is documented within the Predict data dictionary.

3 Type “G” in the Function field on the Generation main menu.

The following example shows the Status window without the Text field:

```
CSGMAIN              N a t u r a l   C o n s t r u c t             CSGMNM0
  +-----------------------------------------------------------+    1 of 1
  | CSGOPTS            Natural Construct               CSGOPTS0 |
  | Apr 15             Optional Parameters               1 of 1 |
 +---------------------------------------------------------------------------+
 | CSGENPGF                     Natural Construct                          |
 | Apr 15                         Status Window                     1 of 1 |
 |                                                                         |
 | <-- SAVE CUGRS                                                          |
 | --> FRAME CUGRF9                                                        |
 |     --> FRAME CU--B7                                                    |
 |                                                                         |
 +---------------------------------------------------------------------------+
  |   Document in Predict .......... _                       |
  | Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9- |
  |       help  retrn                                        |
  |                                                          |
  +-----------------------------------------------------------+
Function ......... g___  Module ........... CUMNR___ Panel ...... __
Model  ........... CST-READ_________________________ Type........ Subprogram
Command .......... _________________________________ Library .... SYSCST
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help        quit        optns                                      lang
```

Status Window

Miscellaneous Tips and Precautions

The following tips and precautions apply when using the model subprograms:

- If you modify the redefinitions in a parameter data area (PDA), recatalog all subprograms that use the PDA. (You can extend redefinitions without recataloging.)
- In the post-generation subprogram, use the STACK TOP DATA FORMATTED statement so Natural does not process input delimiter and assign characters.
- In the generation subprograms, use the NOTITLE or WRITE TITLE '' statements.
- To remove trailing blanks, use the PRINT (SRC) NOTITLE statement.
- If you include PRINT statements, be sure to use a long line length (LS=150) so Natural does not break the line on a - or other special character.
- You can use an edit mask to write data without embedded spaces. For example:

  ```
  PRINT(SRC) NOTITLE #FIELD(EM='UPDATE-VIEW.'X(32)) ...
  ```

- In user-supplied text strings that are used to build quoted literals, always change single quotation marks to double quotation marks. For example:

  ```
  INCLUDE CU--QUOT             /* Assign #DOUBLE-QUOTE based on ASCII/
                               /* EBCDIC
  EXAMINE #PDAX-HEADING FOR ''''
  AND REPLACE WITH #DOUBLE-QUOTE
  ```

  CU--QUOT is supplied with Natural Construct.

Note: For double-byte languages, such as Kanji, use the CSUEXAM subprogram to perform the Examine and Replace operations.

- Although it is always better to use the *n* extension when using SYSERR numbers to define field prompts, you can divide the contents of a delimited (indicated by the / character) SYSERR message with a single definition — if the field prompts are all the same length and are defined in the LDA one after the other as follows:

  ```
  #FIELD-ONE   A 10  INIT<'*1234'>
  #FIELD-TWO   A 10
  #FIELD-THREE A 10
  ```

  If the SYSERR message is “prompt1/prompt2/prompt3”, the result is #FIELD-ONE = prompt1, #FIELD-TWO = prompt2, and #FIELD-THREE = prompt3.

Implementing Your Model

After testing the code frames and model components (data areas, model subprograms, maps, etc.), you are ready to make your model available to developers in the Generation subsystem. To do this, use the SYSMAIN utility to copy all the model components to the SYSLIBS library.

Statement Models

Statement models generate portions of code, such as Natural statements, Predict views, and field processing code, which can be used in programs generated by your programmers/analysts.

To create a statement model, specify a period (.) in the Type field on the Maintain Models panel when you define the model. Typically, a statement model uses a parameter data area (PDA), a maintenance subprogram, and a pre-generation subprogram (most do not use code frames). Statement models do not support user exit code. After defining the model and its components, you use the SYSMAIN utility to move the model components into the SYSLIBS library.

Statement models are designed to look like the statement syntax they are generating. For example, the If model looks like the IF statement:

```
IF ____________________________________________________________________
THEN

_______________________________________________________________________

_______________________________________________________________________
ELSE

_______________________________________________________________________

_______________________________________________________________________
END-IF
```

The screen text looks exactly like the Natural syntax. This also eliminates the need for translation, thus improving performance and screen presentation.

To invoke a statement model, the developer issues the .G line command in the User Exit, code frame, or Natural program editor. Using statement models can give your programmers/analysts a variety of benefits, including:

- Reduce the need to refer to the *Natural Reference Manual* for the statement syntax.
- Reduce the keystrokes required to code Natural statements, since keywords are automatically generated.
- Generate statements into their programs that have a consistent indentation.
- Allow their programs to perform tedious calculations (centering headings within a window, for example).
- Allow their programs to access system files and automatically retrieve Predict views, SYSERR message numbers, etc.

For information about invoking and using statement models, see the statement model chapter in *Natural Construct Generation User's Manual*.

Code Alignment of Generated Statement Models

By default, Natural Construct aligns the generated block of code so the first generated statement is indented by the same amount as the line on which the .G command was entered. If you do not want your model to use this alignment, generate a ** line as the first line of your generated code.

Utility Subprograms and Helproutines

Natural Construct provides many subprograms and helproutines to simplify and standardize the model creation process. These utilities, which are used by the supplied models, can also be used by your models. The source for these utilities is not supplied.

All subprograms use an external parameter data area (PDA). The source for this PDA is in the SYSCST library. Use this PDA as the local data area (LDA) in the invoking subprograms to determine required parameters. Parameters are documented within the PDA.

The supplied utilities are divided into categories, based on the type of information they access. The names of these subprograms and helproutines begin with one of the following prefixes:

Prefix	Description
CPU	Predict data retrieval subprograms.
CPH	Predict data helproutines.
CNU	Natural data retrieval subprograms.
CNH	Natural data helproutines.
CSU	Natural Construct utility subprograms.

Note: For more information about the supplied utility subprograms and helproutines, see **Natural Construct Generation Utility Subprograms (CSU*)**, page 378.

NEW MODEL EXAMPLE

This chapter contains an example of creating a new model using the procedure described in **Building a New Model**, page 121. The model, Menu, generates a program that displays several choices to a user and allows the user to select one. For an example of a generated menu program, see the NCMAIN program in the demo library.

The following topics are covered:

Procedure for Building the Example Model

The example model, Menu, generates a program that displays a menu from which the user can select options.

➢ To build the model example:

1. Define the scope of the model.
2. Create the prototype.
3. Scrutinize the prototype.
4. Isolate the parameters in the prototype.
5. Create the code frame and define the model.
6. Create the model PDA (parameter data area).
7. Create the translation LDAs (local data areas) and maintenance maps.
8. Create the model subprograms.
9. Implement your model.

The following sections describe the steps to create the Menu model.

Defining the Scope of the Model

A program generated by the Menu model must provide a list of options and descriptions to the user for selection. The INPUT statement can be generated by Natural Construct or supplied by the developer.

Creating the Prototype

After defining the scope of the model, create a prototype to handle the most complex function and then refine the prototype to handle the simpler functions.

The following example shows the output from the NCMAIN prototype:

```
NCMAIN                 ***** ACME DEPARTMENT STORES *****              NCLAYMN1
Apr 02,                         - MAIN MENU -                          04:11 PM

                   Code |  Subsystem
                 +------+-----------------------------------------------+
                 |  C   |  Customer                                     |
                 |  T   |  Table Maintenance                            |
                 |  O   |  Order                                        |
                 |      |                                               |
                 |      |                                               |
                 |      |                                               |
                 |      |                                               |
                 |      |                                               |
                 |      |                                               |
                 |      |                                               |
                 |  ?   |  Help                                         |
                 |  .   |  Terminate                                    |
                 +------------------------------------------------------+
          Code: __
Direct Command: ____________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
   help retrn quit    flip                main
```

Output from the NCMAIN Menu Program

Scrutinizing the Prototype

After creating the prototype, follow the steps outlined in **Step 3: Scrutinize the Prototype**, page 124 to ensure that all of the assumptions are correct and the scope of the model has been addressed.

Isolating the Parameters in the Prototype

Next, identify data that must be supplied by parameters. This data is described in the following sections.

Parameters for the Program Header

The parameters supplied for the program header are:

- Name of the program that is generated.
- Application to which the generated program belongs.
- Date and time the program was generated.
- Title and description of the program.

Parameters for the Program Body

The parameters supplied for the program body are:

- Name of the global data area (GDA).
- Map used by the generated program.
- List of functions and their descriptions.

Creating the Code Frame and Defining the Model

Creating the Code Frame

Once you have identified all data that must be supplied by parameters, create the code frame (CMNA?) for the model.

Example of the Code Frame

For an example of the code frame for the Menu model, read the CMNA? code frame (stored in the SYSCST library) into the Code Frame editor.

➢ To create the code frame:

1 Read the prototype into the Code Frame editor and define the substitution parameters.
To identify a substitution parameter, locate the character strings that begin with an ampersand (&) character.

The following table shows examples of substitution parameters in the code frame:

Line Number	**Code**
4	`GLOBAL USING &GDA &WITH-BLOCK`
29	`01 #CODE-IN-LIST(A2/1:12) INIT<`
30	`&CODE-LIST>`
106	`USING MAP '&MAP-NAME'`

2 Create the user exits.
To allow developers to specify additional parameters, local data, or Natural statements, include the following user exits:

User Exit	Description
CHANGE-HISTORY	Generates comment lines indicating the date and ID of the person who created or modified the program. The developer provides a description of changes.
LOCAL-DATA	Defines additional local variables used in the generated program.
START-OF-PROGRAM	Defines code that is executed once at the beginning of the generated program — after all standard initial values are assigned. For example, this user exit code can initialize input values from globals.
BEFORE-INPUT	Defines code that is executed immediately before the INPUT statement is executed (before each input panel is displayed). For example, this user exit code can issue the SET CONTROL statements.
AFTER-INPUT	Defines code that is executed immediately after the INPUT statement is executed (after each input panel is displayed).
BEFORE-PROCESSING-MENU-CODES	Defines code that is executed before the menu code is processed.
SPECIAL-CODE-PROCESSING	Defines code that is executed when a menu code does not FETCH a program.
END-OF-PROGRAM	Contains code that is executed once before the program is terminated. For example, this user exit code can assign a termination message.
SET-PF-KEYS	Defines code that is executed before the PF-keys are set and allows non-standard PF-keys to be added to the program. (The additional PF-keys are defined in the CDKEYLDA local data area.)

3 Create the code frame conditions.
To create conditional code, insert the condition name and condition level number in the code frame. To view some examples of conditional code, read the Menu model code frame, CMNA?, into the Code Frame editor and refer to the following condition names:

- GDA-SPECIFIED
- DIRECT-COMMAND-PROCESSING
- MAP-USED

Defining the Model

At this point, you can define the model to Natural Construct using the Maintain Models function on the Administration main menu.

Model subprograms are prefixed by CUMN, where CU identifies the subprogram as a Natural Construct model subprogram and MN identifies the model (Menu).

Note: The CU prefix is used by the models supplied with Natural Construct. When you create a new model or modify a supplied model, use a CX prefix. For this example, we use a CU prefix.

The Menu model contains the following subprograms:

Subprogram	Description
CUMNPDA	Model parameter data area (PDA).
CUMNMA0	Map associated with the first maintenance subprogram.
CUMNMA	First maintenance subprogram.
CUMNMB0	Map associated with the second maintenance subprogram.
CUMNMB	Second maintenance subprogram.
CUMNC	Clear subprogram.
CUMNR	Read subprogram.

Subprogram	Description (continued)
CUMNPR	Pre-generation subprogram.
CUMNPS	Post-generation subprogram.
CUMNS	Save subprogram.
CUMNGAAA	Generation subprogram.
CUMNSAAA	Sample subprogram.
CUMND	Document subprogram.
CMNA?	Code frame containing the header and main body for the generated program.

➢ To add the Menu model to Natural Construct:

1 Invoke the Maintain Models function from the Administration main menu.

2 Specify the following parameters on the Maintain Models panel:

```
CSDFM              N A T U R A L   C O N S T R U C T             CSDFM0
Oct 08                       Maintain Models                      1 of 1

Action .................... __ A,B,C,D,M,N,P,R
Model ..................... MENU____________________________
Description ........ *0200.1___________________________________________________
                     MENU Program
  PDA name ................ CUMNPDA_     Status window ........... Y
  Programming mode ......... S_          Comment start indicator .. **_
  Type .................... P Program    Comment end indicator .... ___

  Code frame(s) ........... CMNA?___  ________  ________  ________  ________
  Modify server specificatn  CUMNMA__  CUMNMB__  ________  ________  ________
                            ________  ________  ________  ________  ________
  Modify client specificatn  CUMNMA__  CUMNMB__  ________  ________  ________
                            ________  ________  ________  ________  ________

  Clear specification ...... CUMNC___     Post-generation .......... CUMNPS__
  Read specification ....... CUMNR___     Save specification ....... CUMNS___
  Pre-generation ........... CUMNPR__     Document specification ... CUMND___
Command ........... ______________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit  frame                                          main
```

Maintain Models Panel

Most of the components listed on the previous page are listed on this panel. The components that are not listed on this panel are assigned through subprograms or code frames. The CUMNMA0 and CUMNMB0 maps are invoked through the CUMNMA and CUMNMB maintenance subprograms, respectively. The generation subprogram is assigned through the CMNA? code frame.

For more information about defining a model, see **Defining the Scope of the Model**, page 191.

Creating the Model PDA

Use the CST-PDA model in the Generation subsystem to create the parameter data area (PDA) for the model (CUMNPDA).

Example of the Model PDA

For an example of the parameter data area for the Menu model, see the CUMNPDA parameter data area in the SYSCST library.

➢ To create the model PDA:

1 Specify the following parameters on the Generation main menu:
   - Type "M" in the Function field.
   - Type "CUMNPDA" in the Module field.
   - Type "CST-PDA" in the Model field.

2 Press Enter.
The Standard Parameters panel is displayed.

3 Enter "Menu" in the Model field:

```
 CUPDMA                   CST-PDA Parameter Data Area                  CUPDMA1
 Apr 03                       Standard Parameters                       1 of 1

  Module ............. CUMNPDA_
  Model .............. Menu____________________________ *




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main help retrn quit
```

Standard Parameters Panel for the CST-PDA Model

You are returned to the Generation main menu.

4 Enter "G" in the Function field.
Natural Construct generates the PDA.

5 Enter “E” in the Function field.
The Natural data area editor is displayed. Each substitution parameter in the model code frame corresponds to a user area variable in the model PDA that has the same name and a #PDAX- or #PDA- prefix. Each condition variable in the model code frame corresponds to a condition variable in the model PDA that has the same name and a #PDAC- prefix.

6 Specify the type and length of each #PDAX variable.

7 Add any #PDA variables required by the model.

Creating Translation LDAs and Maintenance Maps

Creating the Translation LDAs

To support dynamic translation of text and messages, you can create up to five translation local data areas (LDAs) for each maintenance map; the module that invokes the map must have a translation LDA. Translation LDAs contain the names of the fields on the map that can be translated. To assign the INIT values for these fields, use SYSERR references.

Example of the Translation LDAs

For an example of the translation LDAs for the Menu model, see the CU--MAL and CUMNMBL LDAs in the SYSCST library.

The following example shows a translation LDA:

```
Local     CUXXMAL   Library SYSCST                            DBID  19 FNR  26
Command                                                                    > +
I T L Name                             F Leng Index/Init/EM/Name/Comment
All - -------------------------------- - ---- ---------------------------------
  * * **SAG TRANSLATION LDA
  * * * used by map CUXXMX0.
    1 CUTRMAL
    2 TEXT                                    /* Corresponds to syserr message
    3 #GEN-PROGRAM                     A   20 INIT<'*2000.1,.'>
    3 #TITLE                           A   20 INIT<'*2001.1,.'>
    3 #DESCS                           A   20 INIT<'*2001.2,.'>
    3 #DATA-AREA                       A   20 INIT<'*2097.3,.'>
    3 #LANGUAGE                        A   20 INIT<'*1309.2,.'>
  R 2 TEXT
    3 TRANSLATION-TEXT
    4 TEXT-ARRAY                       A    1 (1:100)
    2 ADDITIONAL-PARMS
    3 #MESSAGE-LIBRARY                 A    8 INIT<'CSTLDA'>
    3 #LDA-NAME                        A    8 INIT<'CUXXMAL'>
    3 #TEXT-REQUIRED                   L      INIT<TRUE>
    3 #LENGTH-OVERRIDE                 I    4 /* Explicit len to translate
----------------------------------------------------------------- S 17   L 1
```

Example of a Translation LDA

➢ To create your translation LDAs:

1 Copy an existing translation LDA.

2 Define the fields for which you want dynamic translation.

All translation LDAs must have the format shown in the example above. For more information, see **Step 7: Create the Translation LDAs and Maintenance Maps**, page 163.

Creating the Maintenance Maps

The model uses one or more maintenance maps to accept parameters from a user. To create the maintenance maps, use one of the following methods:

- Copy an existing maintenance map and modify it to suit your requirements.
- Create the map in the Natural Map editor.
- Create the map using the Natural Construct Map model.

Example of the Maintenance Maps

For an example of the maintenance maps for the Menu model, see the CU--MA0 and CUMNMB0 maps in the SYSCST library.

The CU--MA0 maintenance map contains the following input fields:

Field	**Description**
Module	Name of the menu to be generated.
System	Name of the system (usually the library name).
Global data area	Name of the global data area (GDA) used by this menu program. Developers can display a field-level help window to select a value for this field.
With block	Name of the GDA block used by this menu program (if desired).

Field	Description (continued)
Title	Title for the menu program. This title identifies the program for the List Generated Modules function on the Generation main menu.
Description	Brief description of what the program does. This description is written in the program banner.
First header	First heading displayed on the generated menu.
Second header	Second heading displayed on the generated menu.
Command	Indicates whether the menu supports a Direct Command line. This field is marked by default.
Message numbers	Indicates whether the menu uses message numbers (if field is marked) or message text (if field is blank).
Password	Indicates whether the menu is password protected.

The CUMNMB0 maintenance map contains the following input fields:

Field	Description
Map layout	Name of the map layout (form) used to create the menu panel. Developers can display a field-level help window to select a value for this field.
Code	1- or 2-character code used to invoke the functions listed on the menu. Each code must have a corresponding function.
Functions	Functions listed on the menu. Each function must have a corresponding code. If desired, developers can change the word, Functions, to another value.
Program Name	Name of the program that is invoked when the corresponding function is selected. Developers can display a field-level help window to select a value for this field.

Field	Description (continued)
Optional Parameters	Indicates whether additional input parameters are required (user must enter a value) or optional. Developers can specify a maximum of four additional parameters (using PF5). On the menu, the parameters are displayed as column headings to the right of the Function heading and as input fields below the Code field. If additional parameters are specified, Natural Construct generates a legend (R for Required, O for Optional). The legend is aligned under the first occurrence of a Required or Optional indicator.

Creating the Model Subprograms

After you create the code frame, PDA, maintenance maps, and translation LDAs for the Menu model, you are ready to create the model subprograms. The following sections describe how to create each of the model subprograms.

Creating the Maintenance Subprograms

Use the CST-Modify model in the Generation subsystem to create the maintenance subprograms (CUMNMA and CUMNMB). These subprograms invoke the CUMNMA0 and CUMNMB0 maps, respectively.

Example of the Maintenance Subprograms

For an example of the maintenance subprograms for the Menu model, see the CUMNMA and CUMNMB subprograms in the SYSCST library.

➢ To create the CUMNMA maintenance subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGIMA                       CST-Modify Subprogram                    CUGIMA0
 Oct 09                        Standard Parameters                      1 of 1

  Module ............. CUMNMA__
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Modify Subp___
  Description ........ This subprogram is used as modify panel 1_____________
                       1 of 2________________________________________________
                       ______________________________________________________
                       ______________________________________________________

  Map name ........... CU--MA0_ *
  Translation LDAs ... CU--MAL_ ________ ________ ________ ________ *
  Cursor translation . X

  First header ....... ______________________________________________________
  Second header ...... *0311.1,+/54__________________________________________

  Subpanel ........... _
  Window support ..... _
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit        windw pfkey                   left  userX main
```

Standard Parameters Panel for the
CUMNMA Maintenance Subprogram

➢ To create the CUMNMB maintenance subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGIMA                       CST-Modify Subprogram                      CUGIMA0
 Oct 09                        Standard Parameters                        1 of 1

  Module ............. CUMNMB__
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Modify Subp___
  Description ........ This subprogram is used as modify panel 2_____________
                       2 of 2________________________________________________
                       ______________________________________________________
                       ______________________________________________________

  Map name ........... CUMNMB0_ *
  Translation LDAs ... CUMNMBL_ ________ ________ ________ ________ *
  Cursor translation . X

  First header ....... ______________________________________________________
  Second header ...... *0310.1,+/54__________________________________________

  Subpanel ........... _
  Window support ..... _
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit        windw pfkey                   left  userX main
```

Standard Parameters Panel for the
CUMNMB Maintenance Subprogram

Creating the Pre-generation Subprogram

Use the CST-Pregen model in the Generation subsystem to create the pre-generation subprogram.

Example of the Pre-generation Subprogram

For an example of the pre-generation subprogram for the Menu model, see the CUMNPR subprogram in the SYSCST library.

➢ To create the CUMNPR pre-generation subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGPMA                      CST-Pregen Subprogram                    CUG-MA0
 Oct 09                       Standard Parameters                      1 of 1

  Module ............. CUMNPR__
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Pregen Subp
  Description ........ Pre-generate subprogram.  ...___________________________
                       Set conditions and assign shared PDA variables.
                       _______________________________________________________
                       _______________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the
CUMNPR Pre-Generation Subprogram

Creating the Post-generation Subprogram

Use the CST-Postgen model in the Generation subsystem to create the post-generation subprogram.

Example of the Post-generation Subprogram

For an example of the post-generation subprogram for the Menu model, see the CUMNPS subprogram in the SYSCST library.

➢ To create the CUMNPS post-generation subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGOMA                     CST-Postgen Subprogram                   CUGOMA0
 Oct 09                      Standard Parameters                       1 of 1


  Module ............. CUMNPS__
  Model .............. MENU____________________________ *

  Title .............. Menu Model Post-Gen Subp_
  Description ........ Post-generation parameters for the Menu model.________
                       __________________________________________________________
                       __________________________________________________________
                       __________________________________________________________








Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the
CUMNPS Post-Generation Subprogram

Creating the Clear Subprogram

Use the CST-Clear model in the Generation subsystem to create the clear subprogram. The Menu model requires a clear subprogram because the #PDA-USER-AREA field is redefined into non-alphanumeric variables (for example, #PDA-USER-PARM-LENGTH and #PDA-CODE-LENGTH) and the Description field on the first maintenance panel needs default text.

Example of the Clear Subprogram

For an example of the clear subprogram for the Menu model, see the CUMNC subprogram in the SYSCST library.

➢ To create the CUMNC clear subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGCMA                      CST-Clear Subprogram                   CUG-MA0
 Oct 09                      Standard Parameters                     1 of 1

  Module ............. CUMNC___
  Parameter data area  CUMNPDA_ *

  Title ............. Menu Model Clear Subp____
  Description ........ Clear specification parameters and assign initial value
                       ______________________________________________________
                       ______________________________________________________
                       ______________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                           userX main
```

Standard Parameters Panel for the
CUMNC Clear Subprogram

Creating the Save Subprogram

Use the CST-Save model in the Generation subsystem to create the save subprogram. The save subprogram allows the model to read a previously-generated program.

Example of the Save Subprogram

For an example of the save subprogram for the Menu model, see the CUMNS subprogram in the SYSCST library.

➢ To create the CUMNS save subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGAMA                        CST-SAVE Subprogram                     CUG-MA0
 Oct 09                        Standard Parameters                      1 of 1

  Module ............. CUMNS___
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Save Subp_____
  Description ........ Save specification parameters for the menu model_______
                       _______________________________________________________
                       _______________________________________________________
                       _______________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                             userX main
```

Standard Parameters Panel for the
CUMNS Save Subprogram

Creating the Read Subprogram

Use the CST-Read model in the Generation subsystem to create the read subprogram.

Example of the Read Subprogram

For an example of the read subprogram for the Menu model, see the CUMNR subprogram in the SYSCST library.

➢ To create the CUMNR read subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGRMA                      CST-Read Subprogram                    CUG-MA0
 Oct 09                      Standard Parameters                     1 of 1

  Module ............. CUMNR___
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Read Subp_____
  Description ........ Read parameter specifications _____________________
                       _______________________________________________________
                       _______________________________________________________
                       _______________________________________________________







Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the
CUMNR Read Subprogram

Creating the Generation Subprogram

Use the CST-Frame model in the Generation subsystem to create the generation subprogram.

Example of the Generation Subprogram

For an example of the generation subprogram for the Menu model, see the CUMNGGL subprogram in the SYSCST library.

➢ To create the CUMNGGL generation subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGFMA                        CST-Frame Subprogram                      CUG-MA0
 Oct 09                        Standard Parameters                        1 of 1

  Module ............. CUMNGGL_
  Parameter data area  CUMNPDA_ *

  Title .............. Menu Model Frame Subp____
  Description ........ Generation parameter variables (if length and format
                       are specified)__________________________________________
                       ____________________________________________________
                       ____________________________________________________










Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the
CUMNGGL Generation Subprogram

Creating the Document Subprogram

Use the CST-Document model in the Generation subsystem to create the document subprogram.

Example of the Document Subprogram

For an example of the document subprogram for the Menu model, see the CUMND subprogram in the SYSCST library.

➢ To create the CUMND document subprogram:

1 Specify the following parameters on the Standard Parameters panel:

```
 CUGDMA                    CST-Document Subprogram                    CUGDMA0
 Oct 09                      Standard Parameters                       1 of 2

  Module ............. CUMND___
  Model .............. Menu____________________________ *
  Maps ............... CU--MAO_ CUMNMBO_ ________ ________ ________ *
                       ________ ________ ________ ________ ________ *
  Translation LDAs ... CU--MAL_ CUMNMBL_ ________ ________ ________ *
                       ________ ________ ________ ________ ________ *

  Title .............. Menu Model Document Subp_
  Description ........ Writes Predict documentation for the Menu model____
                       ______________________________________________________
                       ______________________________________________________
                       ______________________________________________________






Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
right help  retrn quit                                            right main
```

Standard Parameters Panel for the
CUMND Document Subprogram

2 Press PF11 (right).
The Additional Parameters panel is displayed.

3 Specify the following parameters:

```
 CUGDMB                    CST-Document Subprogram                     CUGDMB0
 Oct 09                     Additional Parameters                       2 of 2

   Help Text .......... Type ..... O
                        Major .... Model___________________________
                        Minor .... Menu____________________________

        Description
   1    _________________________________________________________________________
   2    _________________________________________________________________________
   3    _________________________________________________________________________
   4    _________________________________________________________________________
   5    _________________________________________________________________________
   6    _________________________________________________________________________
   7    _________________________________________________________________________
   8    _________________________________________________________________________
   9    _________________________________________________________________________
   10   _________________________________________________________________________



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                      left  userX main
```

Specific Parameters Panel for the
CUMND Document Subprogram

Test the Model Subprograms

Natural Construct supplies a utility to help you test the model subprograms.

➢ To invoke the model subprogram test utility:

1 Log onto the SYSCST library.

2 Enter CSUTEST at the Next prompt (Direct Command box for Unix).
The Single Module Test Program panel is displayed. For information about this panel, see **Testing the Model Subprograms**, page 178.

Implementing the Model

After creating and testing the code frames and model components (data areas, model subprograms, maps, etc.), copy all components to the SYSLIBS library.

➢ To implement the model:

1. Invoke the SYSMAIN utility from the Next prompt.
2. Copy all the model components to the SYSLIBS library.

   Your new model is now ready for use in the Generation subsystem.

CST-PDA MODEL

All models require three external parameter data areas (PDAs): the model PDA, CU—PDA, and CSASTD. CU—PDA and CSASTD are supplied with Natural Construct. The model PDA is user-created and contains variables and conditions specific to the model. This chapter describes how to use the CST-PDA model to generate the model PDA.

The following topics are covered:

Introduction

All models require the following external parameter data areas (PDAs):

PDA	Description
Model PDA	User-defined; contains variables and conditions specific to a model.
Note:	If you are creating a model that generates modules to run on a Natural Construct client, you must also generate a stream subprogram to convert the contents of the model PDA into a format that can be transmitted between the client and the server. For information, see **CST-Stream Model**, page 287.
CU—PDA	Supplied with Natural Construct.
CSASTD	Supplied with Natural Construct.

Two of the data areas are supplied; you create the model PDA for each model. The model PDA passes information between the Natural Construct nucleus and the model and generation subprograms.

Before generating your model PDA, create the code frames and define your model to Natural Construct. Natural Construct uses information in the model code frames to generate the model PDA, such as:

- substitution parameters
- condition codes

For information about isolating the parameters for your model PDA, see **Step 4: Isolate the Parameters in the Prototype**, page 125.

For information about creating code frames and defining models, see **Step 5: Create Code Frame(s) and Define the Model**, page 126.

For more information about creating the model PDA, see **Step 6: Create the Model PDA**, page 142.

For an example of a generated model PDA, see the CUMNPDA parameter data area in the SYSCST library.

Parameters for the CST-PDA Model

After you create the code frames and define your model, use the CST-PDA model to generate the model PDA. The CST-PDA model has one specification panel: Standard Parameters. This panel is described in the following section.

Standard Parameters Panel

```
 CUPDMA               CST-PDA Parameter Data Area                   CUPDMA1
 Feb 06                   Standard Parameters                        1 of 1

  Module name ........ CXMNPDA_
  Model name ......... ________________________________ *











Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                                main
```

Standard Parameters Panel for the CST-PDA Model

The fields on this panel are:

Field	Description
Module name	Name of the model PDA (the name specified on the Generation main menu). The name must be alphanumeric and no more than 8 characters in length. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Model name	Name of the model that uses the model PDA. (The specified model and its corresponding code frames must be defined on the Maintain Models panel.)

After you specify the required parameters and generate the model PDA, edit the generated code and assign the correct format and length for each field. All substitution parameters are generated with a default format and length of A10. You can also add any new parameters your model PDA may require.

Layout of the Generated Model PDA

The CST-PDA model builds the model PDA by scanning the model code frames for substitution parameters and condition codes. Substitution parameters are character strings that begin with an ampersand (&) and end with a special character such as a period (.), parentheses, or an asterisk (*), but not a hyphen (-).

For each substitution parameter, the model generates a field (prefixed by #PDAX) within the redefinition of the #PDA-USER-AREA field in the model PDA. The model assigns the default format and length for alphanumeric fields (A10), which you can change as required. (For more information, see **General Information** in *Natural 2 Reference Manual.)*

For each condition code, the model generates a logical field (prefixed by #PDAC) within the redefinition of the #PDA-CONDITION-CODES field in the model PDA.

CST-CLEAR MODEL

This chapter describes how to use the CST-Clear model to generate the clear subprogram for your model. The clear subprogram resets variables in the model PDA.

The following topics are covered:

Introduction

After you define the model PDA, use the CST-Clear model to generate the clear subprogram for your model. The clear subprogram resets the #PDA-USER-AREA variables in the model PDA. If the #PDA-USER-AREA alphanumeric field is redefined into a non-alphanumeric field that does not contain data according to the specified format, an abnormal termination may occur when it is used. To avoid this, the clear subprogram can reset redefined non-alphanumeric fields. Only non-alphanumeric variables are reset. The clear subprogram can also assign initial default values for user parameters.

The CST-Clear model assumes that your model PDA has the RESET-STRUCTURE group level name. For example:

```
 *
 *   User defined parameter area
   2 #PDA-USER-AREA                 A  100 (1:40)
 R 2 #PDA-USER-AREA                      /* REDEF. BEGIN : #PDA-USER-AREA
    3 RESET-STRUCTURE
 *
```

Note: A model PDA generated by the CST-PDA model contains the RESET-STRUCTURE field.

If you do not specify a clear subprogram, the Clear Edit Buffer function on the Generation main menu sets the #PDA-USER-AREA field to blanks. The edit buffer is always cleared, regardless of whether the model uses a clear subprogram.

The nucleus invokes the clear subprogram in the following situations:

- When a user invokes the Clear Edit Buffer function on the Generation main menu.
- When a user changes the model name and the new model uses a different PDA.
- Immediately before the Read Specifications function is invoked on the Generation main menu.

For an example of a generated clear subprogram, see the CUMNC subprogram in the SYSCST library.

Parameters for the CST-Clear Model

Use the CST-Clear model to generate the clear subprogram. The CST-Clear model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGCMA                       CST-Clear Subprogram                     CUG-MA0
 Aug 09                       Standard Parameters                       1 of 1

  Module name ........ CXMNC___
  Parameter data area  CXMNPDA_ *

  Title ............. Clear ...________________
  Description ........ Clear specification Parameters ...______________________
                       ________________________________________________________
                       ________________________________________________________
                       ________________________________________________________







Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the CST-Clear Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the clear subprogram must be alphanumeric and no more than 8 characters in length. Use the following naming convention: CX*xx*C where *xx* uniquely identifies your model.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the name of the PDA by the Module name was specified on the Generation main menu. For example, if you entered CXMNC as the name of the clear subprogram, Natural Construct assumes the name of the PDA is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the clear subprogram. The title identifies the generated clear subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the clear subprogram. The description is inserted in the banner at the beginning of the clear subprogram and is used internally for program documentation.

User Exits for the CST-Clear Model

```
CSGSAMPL                  CST-Clear Subprogram                    CSGSM0
Aug 09                         User Exits                         1 of 1

             User Exits           Exists    Sample   Required Conditional
 -------------------------------- -------- ---------- -------- ----------
 _  CHANGE-HISTORY                         Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA
 _  PROVIDE-DEFAULT-VALUES                 Subprogram
 _  BEFORE-CHECK-ERROR                     Example
 _  ADDITIONAL-INITIALIZATIONS             Example
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Clear Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-READ MODEL

This chapter describes the CST-Read model used to generate the read subprogram for your model. The read subprogram reads the specifications for the model.

The following topics are covered:

Introduction

After you define the model PDA and clear subprogram, generate a read subprogram to read the specifications from a previously-generated module. The generated subprogram has one INPUT statement for each #PDAX variable in the model PDA.

A read subprogram generated by the CST-Read model contains a series of INPUT statements that accept the data previously placed in the Natural stack. The read subprogram is invoked when the developer invokes the Read Specifications function on the Generation main menu.

Before the read subprogram is invoked, all **SAG parameter values are placed on the Natural stack. The read subprogram repeats a series of INPUT statements to accept the stacked parameters and assign them to the correct PDA variables. This subprogram must correspond to the save subprogram that writes the **SAG parameter lines. The read subprogram can also read common parameters from a different model.

Note: Natural Construct invokes the clear subprogram before invoking the read subprogram. It is not necessary to save null parameter values.

For an example of a generated read subprogram, see the CUMNR subprogram in the SYSCST library.

Parameters for the CST-Read Model

Use the CST-Read model in the Generation subsystem to generate the read subprogram. The CST-Read model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGRMA                       CST-Read Subprogram                        CUG-MA1
 Feb 13                       Standard Parameters                         1 of 1

  Module name ........ CXMNR___
  Parameter data area  CXMNPDA_ *

  Title .............. ___________________________
  Description ........ Read parameter specification.____________________________
                       __________________________________________________________
                       __________________________________________________________
                       __________________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                               userX main
```

Standard Parameters Panel for the CST-Read Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. This name must be alphanumeric and no more than 8 characters in length. Use the following naming convention: CX*xx*R where *xx* uniquely identifies your model.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the name of the PDA by the Module name was specified on the Generation main menu. For example, if you entered CXMNR as the read subprogram name, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the read subprogram. The title identifies the generated read subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the read subprogram. The description is inserted in the banner at the beginning of the read subprogram and is used internally for program documentation.

User Exits for the CST-Read Model

```
CSGSAMPL                    CST-Read Subprogram                     CSGSM0
Oct 09                          User Exits                          1 of 1

           User Exits             Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                           Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA                                Example
 _  INPUT-ADDITIONAL-PARAMETERS              Subprogram
 _  BEFORE-CHECK-ERROR                       Example
 _  ADDITIONAL-INITIALIZATIONS
 _  END-OF-PROGRAM
```

CST-Read User Exits Panel

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-SAVE MODEL

This chapter describes the CST-Save model, which you use to generate the save subprogram for your model. The save subprogram writes the specification parameters to the source buffer.

The following topics are covered:

Introduction

To read an existing program, your model must have both a save and a read subprogram. The save subprogram must contain a separate WRITE statement for each specification parameter (#PDAX variable). Use the equal sign (=) notation to include the variable contents with the name of the variables. For example:

```
WRITE(SRC) NOTITLE '=' #PDAX-variable-name
```

Note: Use a separate WRITE statement for each component of an array.

For an example of a save subprogram, see the CUMNS subprogram in the SYSCST library.

Parameters for the CST-Save Model

Use the CST-Save model in the Generation subsystem to generate the save subprogram. The CST-Save model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGAMA                        CST-Save Subprogram                       CUG-MA1
 Feb 13                        Standard Parameters                        1 of 1

  Module name ........ CXMNS___
  Parameter data area  CXMNPDA_ *

  Title .............. Save ...__________________
  Description ........ Save parameter specification ...________________________
                       _________________________________________________________
                       _________________________________________________________
                       _________________________________________________________








Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                           userX main
```

Standard Parameters Panel for the CST-Save Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the save subprogram must be alphanumeric and no more than 8 characters in length. Use the following naming convention: CX*xx*S where *xx* uniquely identifies your model.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the name of the PDA from the Module name specified on the Generation main menu. For example, if you entered CXMNS as the save subprogram name, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the save subprogram. The title identifies the generated save subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the save subprogram. The description is inserted in the banner at the beginning of the save subprogram and is used internally for program documentation.

User Exits for the CST-Save Model

```
CSGSAMPL                    CST-Save Subprogram                    CSGSM0
Oct 09                           User Exits                          1 of 1

                 User Exits             Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                          Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA                               Example
 _  START-OF-PROGRAM
 X  SAVE-PARAMETERS                          Subprogram    X
 _  BEFORE-CHECK-ERROR                       Example
 _  ADDITIONAL-INITIALIZATIONS               Example
 _  END-OF-PROGRAM
```

CST-Save User Exits Panel

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-MODIFY AND CST-MODIFY-332 MODELS

This chapter describes the CST-Modify and CST-Modify-332 models used to generate the modify subprograms for your model. The CST-Modify model generates specification panels that support dynamic translation. The CST-Modify-332 model is provided for users who want to continue using modify subprograms that were generated using previous versions of Natural Construct.

The following topics are covered:

Introduction

After you define the model PDA, create the clear, read, and save subprograms, and create the maintenance maps and translation LDAs, you can create one or more modify subprograms to collect user-supplied specification parameters (#PDAX variables) and perform validation checks. A modify subprogram can also set the condition codes and #PDA variables.

Modify subprograms are executed in the same order as they appear on the Maintain Models panel. Usually, there is one modify subprogram for every left/right (horizontal) maintenance panel. Data edits should only be applied if the developer presses Enter or PF11 (right). Either the modify subprogram or the maintenance map can validate the parameters.

You should only trap PF-keys that perform specialized functions related to the panel. If you want the PF-key settings to be dependent on the default settings specified on the Control record, the subprogram should not contain hardcoded PF-keys (check the PF-key values using the variables specified in CU—PDA).

The CST-Modify and CST-Modify-332 models are described in the following sections. We recommend you use the CST-Modify model to create new model modify subprograms.

Note: A modify subprogram can test the value of CU—PDA.#PDA-PHASE to identify the phase during which it was invoked (G for generation, M for modification, L for translation, U for sample user exits).

CST-Modify Model

The CST-Modify model generates model modify subprograms that support dynamic translation and multiple languages. To implement dynamic translation, you must also create a maintenance map and one or more translation local data areas (LDAs) for each modify subprogram. For more information, see **Step 7: Create the Translation LDAs and Maintenance Maps**, page 163.

The CST-Modify model generates either a main modify subprogram panel (defined on the Maintain Models panel) or a modify subprogram subpanel (invoked from the main modify subprogram panel using a PF-key). To reduce the amount of information on a panel, we recommend you group similar parameters, such as windowing information, and move that information to a subpanel.

If desired, a subroutine can display the subpanel. Subroutines are typically used to control processes that do not require a panel or subpanel to be displayed. For example, a subroutine can enable backward or forward scrolling or test a function that does not require mandatory edits for generation. Both subprograms and subroutines are invoked by PF-keys from the main modify subprogram panel.

All modify subprograms require a VALIDATE-INPUT subroutine to process mandatory edits. At generation time, the edits for the modify subprogram subpanel are processed first and then the edits for the main modify subprogram panel. Therefore, any subroutine edits should also be included in the VALIDATE-INPUT subroutine. To avoid confusion about the order of execution of the panel and subpanel subroutines, place edit checks in programs rather than in subroutines.

The CST-Modify model also allows you to override the headers and PF-keys defined on the Subprogram record.

For an example of a modify subprogram panel generated by the CST-Modify model, see the CUMNMB subprogram in the SYSCST library. For an example of a modify subprogram subpanel generated by the CST-Modify model, see the CUMNMBA subprogram in SYSCST.

For more information, see **Using SYSERR References**, page 496**.**

Parameters for the CST-Modify Model

Use the CST-Modify model to generate a modify subprogram that supports dynamic translation. This model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGIMA                    CST-Modify Subprogram                    CUGIMA0
 Jun 25                     Standard Parameters                      1 of 1

  Module name ........ CXMNMA__
  Parameter data area  CXMNPDA_ *

  Title .............. Modify ...________________
  Description ........ Modify server specificatn Parameters ...______________
                       ________________________________________________________
                       ________________________________________________________
                       ________________________________________________________

  Map name ........... ________ *
  Translation LDAs ... ________ ________ ________ ________ ________ *
  Cursor translation . _

  First header ....... ________________________________________________________
  Second header ...... ________________________________________________________

  Subpanel ........... _
  Window Support ..... _
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit        windw pfkey                   left  userX main
```

Standard Parameters Panel for the CST-Modify Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the modify subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: Panel: CX*xx*M*y* Subpanel: CX*xx*M*yz* where *xx* uniquely identifies your model and *y* is a letter from A to J that identifies the maintenance panel (A for the first maintenance panel, B for the second, etc.), and *z* is a letter from A to J that identifies the subpanel.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the PDA name based on the Module name specified on the Generation main menu. For example, if you entered CXMNMA as the modify subprogram name, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the modify subprogram. The title identifies the generated modify subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the modify subprogram. The description is inserted in the banner at the beginning of the modify subprogram and is used internally for program documentation.

Field	Description (continued)
Map name	Name of the map for the modify subprogram. Natural Construct determines the name of the map based on the Module name specified on the Generation main menu. For example, if you entered "CXMNMA" as the subprogram name, Natural Construct assumes the map name is CXMNMA0. The specified map must exist in the current library and the map name should correspond to the modify subprogram name, with the addition of a zero. The zero indicates that the map has no hard-coded text and is used for dynamic translation. For example: Program Map CXMNMA CXMNMA0 CXMNMB CXMNMB0
Translation LDAs	Names of the translation local data areas (LDAs) for the modify subprogram. You can specify the names of up to five translation LDAs. The specified translation LDAs must exist. The LDA name should correspond to the modify subprogram name, with the addition of "L". For example: Program Translation LDA CXMNMA CXMNMAL CXMNMB CXMNMBL
Cursor translation	If this field is marked, the generated subprogram panel supports cursor translation (users can modify the text on this panel in translation mode).

Field	Description (continued)
First header	First heading displayed on the generated subprogram panel or the SYSERR number(s) that supplies the heading. By default, this header is automatically populated with the description of the model record. To override this default, specify the new header in this field. To specify the positioning of the heading, use special syntax after the text or SYSERR numbers. By default, the header is displayed at the left margin. To center *First Heading* across 50 bytes, type: *First Heading*,+/50 The text before ",+/" indicates the heading displayed. The number after ",+/ "indicates the number of bytes within which the heading is centered. For information about SYSERR message numbers, see **Using SYSERR References**, page 496 or the **SYSERR Utility** chapter in the *Natural Utilities Manual*.
Note:	Data substitution within SYSERR references is not supported in this context.
Second header	Second heading displayed on the generated panel or the SYSERR number(s) that supplies the heading. By default, this header is populated with the description on the Subprogram record, if it exists. Unlike the Model record, which populates the first header field, the Subprogram record only exists if you create it. To supply a second header (if no Subprogram record exists) or to override the default, specify a new header in this field.
Note:	We recommend you use this field to define the second heading, instead of using the description specified on the Maintain Subprograms panel. The Natural Construct nucleus does not reference the Subprogram record for supplied models, so the description used to populate the second header will not exist unless you create it.

Field	Description (continued)
	To specify the heading position, use special syntax after the text or SYSERR number. By default, the header is displayed at the left margin. To center *Second Heading* across 50 bytes for example, type: *Second Heading*,+/50 The text before the ",+/" indicates the heading displayed. The number after the ",+/" indicates the number of bytes in which the heading is centered. For information about using SYSERR message numbers, see **Using SYSERR References**, page 496 or the **SYSERR Utility** chapter in the *Natural Utilities Manual*.
Note:	Data substitution within SYSERR references is not supported in this context.
Subpanel	If this field is marked, the generated subprogram is a subpanel (invoked from a main panel, such as a help selection window). By default, the Natural Construct nucleus controls the help, retrn, quit, left, right, and main PF-keys (defined on the Natural Construct Control record) for a main panel, and the help, retrn, quit, and main PF-keys for a subpanel. To define the processing for additional keys (the left and right keys, for example) on a subpanel, press PF6 on the Standard Parameters panel. For more information, see **PF6 (pfkey)**, page 247.
Window support	If this field is marked, the generated subprogram is displayed in a window. By default, the PF-keys and messages are displayed within the generated window, and a frame (border) is displayed around the generated window. (To change the default window settings, press PF5 on the Standard Parameters panel. For more information, see **PF5 (windw)**, page 245.

PF5 (windw)

To change the default window settings, press PF5 (windw). The Window Parameters window is displayed:

```
CUGIDWM                    Natural Construct                      CUGIDWM0
Jun 25                     Window Parameters                        1 of 1

Size .........  Height ....... ___
               Width ........ ___

Position .....  Line ......... ___
               Column ....... ___

Frame OFF .... _

Control screen _

Title ........ __________________________________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF
      help  retrn quit                                                 ma
```

Window Parameters Window

The fields in this window are:

Field		Description
Size	Height	Number of lines the window spans. This value is included in the DEFINE WINDOW command generated by the subprogram.
	Width	Number of columns the window spans. This value is included in the DEFINE WINDOW command generated by the subprogram. If the defined width is too small, Natural will adjust the size of the window.
Position	Line	Number of lines between the top of the panel and the top of the window begins. This value is included in the DEFINE WINDOW command generated by the subprogram.

Field		Description (continued)
	Column	Number of columns between the left edge of the panel and the left edge of the window. This value is included in the DEFINE WINDOW command generated by the subprogram. The specified line and column form the top left corner of the window.
Frame OFF		If this field is marked, the window does not use a frame (border).
Control screen		If this field is marked, the PF-keys and messages are displayed within the generated window (CONTROL SCREEN). If this field is blank, the PF-keys and messages are displayed outside the window (CONTROL WINDOW).
Title		Title for the window; may be either text or the name of the variable that supplies the title. The title is automatically centered in the window frame. By default, the window does not have a title.

PF6 (pfkey)

To define the processing for non-standard program function keys (PF-keys), press PF6 (pfkey) on the Standard Parameters panel. The PF-Key Parameters window is displayed:

```
 CUGIMAA                        Natural Construct                          CUGIMAA0
 Jun 25                         PF-key Parameters                            1 of 1

         Subprogram           Subroutine                NAMED
         ---------- ------------------------------- ----------
   PF5    ________  _________________________________ __________
   PF6    ________  _________________________________ __________
   PF9    ________  _________________________________ __________

   PF4    ________  _________________________________ __________ test

   PF7    ________  _________________________________ __________ bkwrd
   PF8    ________  _________________________________ __________ frwrd

   PF10   ________  _________________________________ __________ left
   PF11   ________  _________________________________ __________ right
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                  mai
```

PF-Key Parameters Window

By default, the Natural Construct nucleus controls the help, retrn, quit, left, right, and main PF-keys for a main panel (defined on the Natural Construct Control record), and the help, retrn, quit, and main PF-keys for a subpanel. In this window, you can override the nucleus-controlled PF-keys displayed on a subpanel by:

- Defining the processing and name for a non-standard PF-key
- Changing the processing and/or name for a non-standard PF-key

The fields in this window are:

Field	Description
Subprogram	Name of the subprogram that is executed when the corresponding PF-key is pressed. This subprogram is invoked during generation to process the VALIDATE-INPUT subroutine.
Subroutine	Name of the subroutine that is executed when the corresponding PF-key is pressed.
NAMED	Name of the PF-key (text or a valid SYSERR message number). If this field is blank, the default PF-key names are used. For more information, see **Using SYSERR References**, page 496.

Note: The left and right PF-keys are available only if the maintenance subprogram is a subpanel.

User Exits for the CST-Modify Model

```
CSGSAMPL                    CST-Modify Subprogram                      CSGSM0
Oct 09                            User Exits                            1 of 1

               User Exits            Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                           Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA
 _  START-OF-PROGRAM
 _  BEFORE-CHECK-ERROR                        Example
 _  BEFORE-STANDARD-KEY-CHECK                  Example
 _  ADDITIONAL-TRANSLATIONS
 _  ADDITIONAL-INITIALIZATIONS                Example
 _  BEFORE-INPUT
 _  INPUT-SCREEN                               Example                X
 _  AFTER-INPUT
 _  BEFORE-INVOKE-SUBPANELS                                            X
 _  AFTER-INVOKE-SUBPANELS                                            X
 _  BEFORE-REINPUT-MESSAGE
 _  VALIDATE-DATA                            Subprogram
 _  MISCELLANEOUS-SUBROUTINES                  Example
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
frwrd help  retrn quit                    bkwrd frwrd
```

CST-Modify User Exits Panel 1

```
CSGSAMPL                    CST-Modify Subprogram                      CSGSM0
Oct 09                            User Exits                            1 of 1

               User Exits            Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  END-OF-PROGRAM                            Example
```

CST-Modify User Exits Panel 2

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-Modify-332 Model

Use the CST-Modify-332 model to generate a standard modify subprogram that does not support dynamic translation. This model is provided for existing users who want to continue using modify subprograms that were generated under previous versions of Natural Construct. We recommend you use the CST-Modify model to create new models. For more information, see **CST-Modify Model**, page 239.

Example of a Model Modify Subprogram

```
>                                > + Subprogram  : CXMNMA  Lib: SAG
Top...+....1....+....2....+....3....+....4....+....5....+....6....+..7
**SAG GENERATOR: CONSTRUCT-MODEL-MAINTENANCE model  Version: 3
**SAG TITLE: Modify subprogram
**SAG SYSTEM: NATURAL-CONSTRUCT
**SAG DATA-AREA: CXMNPDA
**SAG MAP: CXMNMA1
**SAG DESCS(1): This modify subprogram accepts all the
**SAG DESCS(2): standard parameters for the MENU model.
************************************************************
* Program  : CXMNMA
* System   : NATURAL-CONSTRUCT
* Title    : Modify subprogram
* Generated: Nov 09,01 at 01:35 PM
* Function : This modify subprogram accepts all the
*            standard parameters for the MENU model.
*
* History
************************************************************
DEFINE DATA
  PARAMETER USING CXMNPDA
  PARAMETER USING CU—PDA
  PARAMETER USING CSASTD
  LOCAL
  01 #PF-KEY(A4)
  01 #PROGRAM(A8)
END-DEFINE
FORMAT PS=24 SG=OFF ZP=OFF KD=ON
ASSIGN #PROGRAM = *PROGRAM
*
PROG.
REPEAT/* To allow escape from
  IF CSASTD.RETURN-CODE NE ' '/* subroutine
    INPUT WITH TEXT CSASTD.MSG ALARM USING MAP 'CXMNMA1'
  ELSE
    INPUT WITH TEXT CSASTD.MSG USING MAP 'CXMNMA1'
  END-IF
  RESET CSASTD.MSG CSASTD.RETURN-CODE
  /*
  /* Perform edits if going forward, else return to driver
  IF NOT *PF-KEY = #PDA-PF-RIGHT OR = 'ENTR'
    ESCAPE BOTTOM(PROG.) IMMEDIATE
  END-IF
**SAG DEFINE EXIT VALIDATE-DATA
```

```
*
* Edit checks on map parameters
  DECIDE FOR EVERY CONDITION
    WHEN #PDA-GEN-PROGRAM = ' '
      REINPUT 'Gen Program is required'
      MARK *#PDA-GEN-PROGRAM ALARM
    WHEN #PDA-SYSTEM = ' '
      REINPUT 'System is required'
      MARK *#PDA-SYSTEM ALARM
    WHEN #PDA-TITLE = ' '
      REINPUT 'Title is required'
      MARK *#PDA-TITLE ALARM
    WHEN #PDAX-DESCS(1) = ' '
      REINPUT 'Descs is required'
      MARK *#PDAX-DESCS(*) ALARM
    WHEN #PDAX-GDA = ' '
      REINPUT 'Gda is required'
      MARK *#PDAX-GDA ALARM
    WHEN #PDAX-HEADER1 = ' '
      REINPUT 'Header1 is required'
      MARK *#PDAX-HEADER1 ALARM
    WHEN NONE IGNORE
  END-DECIDE
**SAG END-EXIT
  ESCAPE BOTTOM(PROG.) IMMEDIATE
END-REPEAT /*PROG.
END
```

Parameters for the CST-Modify-332 Model

The CST-Modify-332 model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGMMA                     CST-Modify-332 Subprogram                    CUGMMA0
 Mar 25                        Standard Parameters                        1 of 1

  Module name ........ CXMNMA__
  Parameter data area  CXMNPDA_ *
  Map name ........... CXMNMA1_ *

  Title .............. __________________________
  Description ........ Maintenance for specification parameters.______________
                       _______________________________________________________
                       _______________________________________________________
                       _______________________________________________________






Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                           userX main
```

Standard Parameters Panel for the CST-Modify-332 Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the modify subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*M*y* where *xx* uniquely identifies your model and *y* is a letter from A to J that identifies the maintenance panel (A for the first maintenance panel, B for the second, etc.).
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the PDA name based on the Module name specified on the Generation main menu. For example, if you entered CXMNMA as the modify subprogram name, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Map name	Name of the map for the modify subprogram. Natural Construct determines the name of the map based on the Module name specified on the Generation main menu. For example, if you entered "CXMNMA" as the modify subprogram name, Natural Construct assumes the map name is CXMNMA1. The map must exist in the current library, and the map name should correspond to the modify subprogram name, with the addition of the language code. For example: Program Map CXMNMA CXMNMA1 (for English)

Field	Description (continued)
Title	Title for the modify subprogram. The title identifies the generated modify subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the modify subprogram. The description is inserted in the banner at the beginning of the modify subprogram and is used internally for program documentation.

User Exits for the CST-Modify-332 Model

```
CSGSAMPL                    CST-Modify-332 Subprogram                    CSGSM0
Oct 09                              User Exits                           1 of 1

                User Exits             Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                          Subprogram
 _  LOCAL-DATA
 _  START-OF-PROGRAM
 _  AFTER-INPUT                              Example
 _  PROCESS-SPECIAL-KEYS                    Subprogram              X
 _  VALIDATE-DATA                           Subprogram
```

User Exits Panel for the CST-Modify-332 Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, *Natural Construct Generation User's Manual*.

CST-PREGEN MODEL

This chapter describes the CST-Pregen model used to generate the pre-generation subprogram for your model. The pre-generation subprogram is invoked after all maintenance subprograms are executed during the generation phase or when the SAMPLE command is issued from the User Exit editor.

The following topics are covered:

Introduction

After generating your maintenance subprograms, you can generate the pre-generation subprogram to assign #PDAC condition values based on user-supplied parameters or other calculated values. The pre-generation subprogram also assigns the values of #PDA variables in the model PDA that are required by any subsequent generation subprograms.

Generated using the CST-Pregen model, this subprogram is invoked after all maintenance subprograms are executed during the generation phase or when the SAMPLE command is issued from the User Exit editor. It is the first user subprogram invoked. (All #PDAC- condition values are reset before the generation process is started.)

The pre-generation subprogram should also calculate the values of any #PDA variables required by subsequent generation subprograms. For simple models that do not have code frames, this subprogram can also perform the functions of a generation subprogram. (Condition code values and derived fields can also be assigned within the maintenance subprograms.)

For an example of a generated pre-generation subprogram, see the CUMNPR subprogram in the SYSCST library.

Parameters for the CST-Pregen Model

Use the CST-Pregen model to generate the pre-generation subprogram. The CST-Pregen model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGPMA                    CST-Pregen Subprogram                    CUG-MA0
 Mar 26                     Standard Parameters                      1 of 1

  Module name ........ CXMNPR_
  Parameter data area  CXMNPDA_ *

  Title .............. Pre-generation subprogram
  Description ........ Pre-generate subprogram._________________________________
                       Set conditions and assign shared PDA variables.________
                       ________________________________________________________
                       ________________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                          userX main
```

Standard Parameters Panel for the CST-Pregen Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the pre-generation subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*PR where *xx* uniquely identifies your model.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the PDA name based on the Module name specified on the Generation main menu. For example, if you entered "CXMNPR" as the pre-generation subprogram name, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the pre-generation subprogram. The title identifies the generated pre-generation subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the pre-generation subprogram. The description is inserted in the banner at the beginning of the pre-generation subprogram and is used internally for program documentation.

User Exits for the CST-Pregen Model

```
CSGSAMPL                    CST-Pregen Subprogram                       CSGSM0
Oct 10                            User Exits                            1 of 1

               User Exits              Exists    Sample   Required Conditional
    ------------------------------- -------- ---------- -------- ------------
 _  CHANGE-HISTORY                            Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA                                 Example
 _  ASSIGN-DERIVED-VALUES                      Subprogram
 _  SET-CONDITION-CODES                        Subprogram    X          X
 _  GENERATE-CODE
 _  BEFORE-CHECK-ERROR                         Example
 _  ADDITIONAL-INITIALIZATIONS                 Example
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Pregen Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-POSTGEN MODEL

This chapter describes the CST-Postgen model used to generate the pre-generation subprogram for your model. The post-generation subprogram supplies values for the substitution parameters in the code frames. This is the final stage of the generation process.

The following topics are covered:

Introduction

After you define the pre-generation subprogram, you can generate the post-generation subprogram to supply values for substitution parameters in the code frames (identified by &). Generated using the CST-Postgen model, this subprogram is invoked as the final stage of the generation process when the application developer enters "G" on the Generation main menu.

The post-generation subprogram substitutes the code frame parameters with the corresponding substitution values by stacking the substitution parameters and their corresponding values. Use the STACK TOP DATA FORMATTED statement to stack these values. Natural Construct performs the corresponding substitutions in the edit buffer and produces the final version of the generated program.

During the generation process, code lines specified in the code frame are written to the edit buffer, as well as the output of the generation subprogram contained in the code frame. Any substitution parameters are included in the edit buffer exactly as they appear in the code frame.

For an example of a generated post-generation subprogram, see the CUMNPS subprogram in the SYSCST library.

Parameters for the CST-Postgen Model

Use the CST-Postgen model to generate the post-generation subprogram. The CST-Postgen model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGOMA                    CST-Postgen Subprogram                      CUGOMA0
 Mar 26                      Standard Parameters                        1 of 1


  Module name ........ CXMNPS__
  Model name ......... ________________________________ *

  Title .............. Post-gen subprogram
  Description ........ Post-generation subprogram. Stack post generation______
                       changes.______________________________________________
                       ______________________________________________________
                       ______________________________________________________








Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                           userX main
```

Standard Parameters Panel for the CST-Postgen Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the post-generation subprogram must be alphanumeric and no more than 8 characters in length. Use the following naming convention: CX*xx*PS where *xx* uniquely identifies your model.
Model name	Name of the model that uses the post-generation subprogram. The model must be defined.
Title	Title for the subprogram. The title identifies the generated subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the subprogram. The description is inserted in the banner at the beginning of the subprogram and is used internally for program documentation.

User Exits for the CST-Postgen Model

```
CSGSAMPL                  CST-Postgen Subprogram                    CSGSM0
Oct 10                          User Exits                          1 of 1

             User Exits            Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                                  Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA                                      Subprogram
 _  START-OF-PROGRAM                                 Example
 _  ADDITIONAL-SUBSTITUTION-VALUES                  Subprogram
 _  BEFORE-CHECK-ERROR                               Example
 _  ADDITIONAL-INITIALIZATIONS                       Example
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Postgen Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-FRAME MODEL

This chapter describes the CST-Frame model. This model creates sample subprograms for user exits and generation subprograms to supply parameters to the model.

The following topics are covered:

Sample Subprograms

Sample subprograms are invoked from a user exit. For more information, see **Parameters Supplied by User Exits**, page 131. Generated using the CST-Frame model, these subprograms help the developer create user exit code by providing a starting sample. They can be simple or complicated, depending on the model.

When creating a sample subprogram, you can include additional parameters to give the developer more control over what is generated into the user exit. To pass additional information to the subprogram, use the CU—PDA.#PDAX-FRAME-PARM variable.

Before invoking the sample subprograms, Natural Construct invokes all maintenance subprograms and the pre-generation subprogram. This ensures that the current specification parameters are valid and the conditions are set.

You can define a sample subprogram by entering ".E" at the beginning of a user exit line in the Code Frame editor.

For more information about defining a sample subprogram, see **Add User Exit Points**, page 132.

Generation Subprograms

Generation subprograms are invoked from a code frame. For more information, see **Parameters Supplied by Generation Subprograms**, page 128. Because the lengths and contents of certain code frame parameters change based on user-supplied input values or information in Predict, these parameters must be supplied by the generation subprograms. The subprograms write statements to the Natural edit buffer, based on user-supplied input parameters or other calculated values.

To write to the edit buffer, include a DEFINE PRINTER(SRC=1) OUTPUT 'SOURCE' statement in the subprogram that routes the output to the source work area. To allow models to be ported to multiple platforms, use the CU--DFPR copycode member to define the SRC printer.

All WRITE, DISPLAY, and PRINT statement output for your print file is written to the edit buffer. Use the NOTITLE option on each of these statements. If a DISPLAY statement is used in the subprogram, also use the NOHDR option. When trailing blanks should be suppressed in variable names, the PRINT statement can be a useful alternative to the WRITE statement. However, you may want to increase the line length of the edit buffer when using the PRINT statement, so variable names are not split at the hyphen (-).

Because generation logic can be highly complex, these subprograms allow ultimate flexibility. However, they are less maintainable than code frame statements because you must change Natural programs to modify the generated code.

Generation subprograms can also accept the #PDA-FRAME-PARM constant code frame parameter from the CU—PDA common parameter data area. This parameter allows a subprogram to be invoked several times within the generation process. Each time the generation subprogram is invoked, it can use the value of this parameter to determine what to generate.

To invoke a generation subprogram, specify line type N at the > prompt in the Code Frame editor. You can also specify the constant parameter value at this prompt.

For an example of a generated generation subprogram, see the CUMNGGL subprogram in the SYSCST library.

Parameters for the CST-Frame Model

Use the CST-Frame model to create the generation or sample subprogram. The CST-Frame model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGFMA                        CST-Frame Subprogram                     CUG-MA0
 Mar 27                        Standard Parameters                       1 of 1

  Module name ........ CXMNGGL_
  Parameter data area  CXMNPDA_ *

  Title .............. Frame ...________________
  Description ........ This generation/sample subprogram ..___________________
                       _______________________________________________________
                       _______________________________________________________
                       _______________________________________________________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                            userX main
```

Standard Parameters Panel for the CST-Frame Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*G*yyy* where *xx* uniquely identifies your model and *yyy* identifies your generation subprogram, or CX*xx*S*yyy* where *xx* uniquely identifies your model and *yyy* identifies your sample subprogram.
Parameter data area	Name of the parameter data area (PDA) for your model. Natural Construct determines the PDA name based on the Module name specified on the Generation main menu. For example, if you entered CXMNGAAA, Natural Construct assumes the PDA name is CXMNPDA. Use the following naming convention: CX*xx*PDA where *xx* uniquely identifies your model.
Title	Title for the frame subprogram. The title identifies the generated frame subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the frame subprogram. The description is inserted in the banner at the beginning of the frame subprogram and is used internally for program documentation.

User Exits for the CST-Frame Model

```
CSGSAMPL                  CST-Frame Subprogram                     CSGSM0
Oct 10                        User Exits                           1 of 1

             User Exits            Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                          Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA
 _  START-OF-PROGRAM
 _  GENERATE-CODE
 _  BEFORE-CHECK-ERROR                       Example
 _  ADDITIONAL-INITIALIZATIONS               Example
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Frame Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120, in *Natural Construct Generation User's Manual*.

CST-DOCUMENT MODEL

This chapter describes the CST-Document model used to generate a document subprogram for your model. The document subprogram writes information about Natural Construct-generated modules in the Predict data dictionary.

The following topics are covered:

Introduction

After you define the generation and sample subprograms, generate the document subprogram to write information about Natural Construct-generated modules in the Predict data dictionary. This information includes a description of the module, as well as a description of the PF-keys and specification parameters for the module.

Note: Before you can document information about the generated modules, you must define the #PDAX-DESCS(*) field within the model PDA.

Generated using the CST-Document model, this subprogram creates a free-form description of the generated module using the specifications from the model panels. You can write this information in any language for which you have translated help text members.

The document subprogram writes the model description to Predict when the developer invokes the Save Specification and Source or Stow Specification and Source function on the Generation main menu and presses PF5 (optns). For a description of the Generation main menu, see **Generation Main Menu**, page 72 in the *Natural Construct Generation User's Manual*.

For an example of a generated document subprogram, see the CUMND subprogram in the SYSCST library.

Parameters for the CST-Document Model

Use the CST-Document model to generate the document subprogram. The CST-Document model has two specification panels, Standard Parameters and Additional Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
CUGDMA                       CST-Document Subprogram                      CUGDMA0
Mar 27                         Standard Parameters                         1 of 2

 Module name ........ CXMND___
 Model name ......... ________________________________ *
 Maps ............... ________ ________ ________ ________ ________ *
                      ________ ________ ________ ________ ________ *
 Translation LDAs ... ________ ________ ________ ________ ________ *
                      ________ ________ ________ ________ ________ *

 Title .............. Document ..._____________
 Description ........ Writes Predict documentation for ...____________________
                      _______________________________________________________
                      _______________________________________________________
                      _______________________________________________________




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                            right main
```

Standard Parameters Panel for the CST-Document Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name specified on the Generation main menu. The name of the document subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*D where *xx* uniquely identifies your model.
Model name	Name of the model that uses the document subprogram. The model must be defined.
Maps	Names of all maps (specification panels) used by the model. The document subprogram retrieves the specification parameters from the specified maps.
Translation LDAs	Names of the translation local data areas (LDAs) for the specified maps. You can specify the names of up to 10 translation LDAs. For more information about translation LDAs, see **Step 7: Create the Translation LDAs and Maintenance Maps**, page 163.
Title	Title for the document subprogram. The title identifies the generated document subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the document subprogram. The description is inserted in the banner at the beginning of the document subprogram and is used internally for program documentation.

Additional Parameters Panel

```
 CUGDMB                    CST-Document Subprogram                     CUGDMB0
 Apr 09                     Additional Parameters                       2 of 2

   Help Text .......... Type ..... _
                        Major .... ________________________________
                        Minor .... ________________________________

        Description
   1    ________________________________________________________________________
   2    ________________________________________________________________________
   3    ________________________________________________________________________
   4    ________________________________________________________________________
   5    ________________________________________________________________________
   6    ________________________________________________________________________
   7    ________________________________________________________________________
   8    ________________________________________________________________________
   9    ________________________________________________________________________
   10   ________________________________________________________________________



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      help  retrn quit                                      left  userX main
```

Additional Parameters Panel for the CST-Document Model

On this panel, you can either:

- Specify the Type, Major, and Minor help text components in the applicable fields. Natural Construct retrieves the description of all modules generated by the model from the Help Text subsystem.

  or

- Enter a brief description of all modules generated by the model on the lines displayed in the Description field.

  The description is written to the Predict data dictionary.

User Exits for the CST-Document Model

```
CSGSAMPL                  Natural Construct                        CSGSM0
Mar 27                  CST-Document User Exits                    1 of 1

          User Exit                Exists    Sample   Required Conditional
    ------------------------------ -------- ---------- -------- ------------
 _  CHANGE-HISTORY                          Subprogram
 _  LOCAL-DATA
 _  START-OF-PROGRAM
 _  ADDITIONAL-TRANSLATIONS
 _  ADDITIONAL-INITIALIZATIONS               Example
 _  DESCRIBE-INPUTS                           Example
 _  PF-KEYS                                 Subprogram
 _  MISCELLANEOUS-VARIABLES                  Subprogram
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Document Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120 in *Natural Construct Generation User's Manual*.

CST-VALIDATE MODEL

This chapter describes the CST-Validate model used to generate the validation subprogram for your model. During the generation process, the validation subprogram verifies inputs for the model.

The following topics are covered:

Introduction

If you code validations within maintenance panel modules, it is difficult to invoke the validations from batch programs or GUI clients. Instead, you can consolidate all model validation within a validation subprogram. To confirm input values for your model, use the CST-Validate model to generate a validation subprogram and then add the subprogram to the model record (on the Maintain Models panel).

The following example shows how to use a validation subprogram to validate inputs for a maintenance panel:

```
**SAG DEFINE EXIT VALIDATE-DATA
  ASSIGN CSAVAL.VALIDATE-SPECIFIC-FIELD(1) = 'field1'
  ASSIGN CSAVAL.VALIDATE-SPECIFIC-FIELD(2) = 'field2'
  ASSIGN CSAVAL.VALIDATE-SPECIFIC-FIELD(3) = 'field3'
  CALLNAT  'CUBOVAL'  CSAVAL
                      CUBOPDA    /*your model PDA name
                      CU—PDA
                      CSAMARK
                      CSAERR
                      CSASTD
  PERFORM  REINPUT-MESSAGE
*
**SAG  END-EXIT
```

Parameters for the CST-Validate Model

Use the CST-Validate model to generate a validation subprogram. The CST-Validate model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
CUVAMA                      CST-Validate Subprogram                    CUVAMA0
Jul 28                        Standard Parameters                       1 of 1

  Module ............. ________
  System ............. C421___________________________

  Title .............. Validate Subprogram ..___
  Description ........ This Validation Subprogram will validate Inputs________
                       for the model: ....____________________________________
                       _______________________________________________________
                       _______________________________________________________


  Model PDA .......... ________ *






Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the CST-Validate Model

The fields on the Standard Parameters panel are:

Field	Description
Module	Name specified on the Generation main menu. The name of the validate subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*VAL where *xx* uniquely identifies your model.
System	Name of the system (by default, the name of the current library). This is a required field. The system name must be alphanumeric and need not be associated with a Natural library ID. (The combination of the module name and system name is used as a key to access help information for the generated module.)
Title	Title for the validate subprogram. The title identifies the generated subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the validate subprogram. The description is inserted in the banner at the beginning of the validate subprogram and is used internally for program documentation.
Model PDA	Name of the PDA used by the model for which you are generating the validation subprogram.

User Exits for the CST-Validate Model

```
CSGSAMPL                        Natural Construct                          CSGSM0
Jul 24                              User Exits                              1 of 1
                User Exit               Exists    Sample   Required Conditional
    ------------------------------- -------- ---------- -------- ------------
 _  CHANGE-HISTORY                             Subprogram
 _  LOCAL-DATA
 _  GENERATE-VALIDATIONS
 _  GENERATE-SUBROUTINES                       Subprogram
```

User Exits Panel for the CST-Validate Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120 in *Natural Construct Generation User's Manual*.

Coding Validations

The CST-Validate model codes validations as subroutines in the GENERATE-SUBROUTINES user exit. For each #PDAX-*FIELD-NAME* field you want to validate, create a subroutine called V-*field-name* to perform the validations. Whenever a validation error is found, the V-*field-name* subroutine must:

- Assign CSASTD.RETURN-CODE = 'E'
- Assign the error message in CSASTD.MSG
- Perform an ESCAPE-ROUTINE to bypass subsequent checks

To retrieve SYSERR messages, use the CU--VERR copycode.

Validating Array Fields

For array fields, the V-*field-name* subroutine validates all occurrences for which validation is requested. These occurrences are supplied in the #INDEX.#FROM (1:3) fields (redefined into #I1, #I2 and #I3). To return multiple errors (for separate field occurrences), perform the CHECK-AFTER-EDIT subroutine when an error occurs within an array field. This will add the error to the error list but allow editing of subsequent indexes to occur. If you do not want to exit the current subroutine, as with array processing, use the CU--VERZ copycode instead of the CU--VERR copycode.

The following example shows the validation routine for a two-dimensional array called #PDAX-PHYSICAL-KEY:

```
**********************************************************************
DEFINE SUBROUTINE V_PHYSICAL-KEY
**********************************************************************
*
  FOR #INDEX.#OCC(1) = #INDEX.#FROM(1) TO #INDEX.#THRU(1)
    FOR #INDEX.#OCC(2) = #INDEX.#FROM(2) TO #INDEX.#THRU(2)
      /*
      /* Validate #PDAX-PHYSICAL-KEY(#I1,#I2)
      ASSIGN CPAEL.FILE-NAME = CUBOPDA.#PDAX-PRIME-FILE
      ASSIGN CPAEL.FILE-CODE = CUBOPDA.#PDAX-PHYSICAL-KEY(#I1,#I2)
      ASSIGN CPAEL.DDM-PREFIX = CPAFI.DDM-PREFIX
      CALLNAT 'CPUEL' CPAEL CSASTD
      IF NOT CPAEL.#FIELD-FOUND
        ASSIGN CNAMSG.MSG-DATA(1) = CPAEL.FIELD-NAME
        ASSIGN CNAMSG.MSG-DATA(3) = CPAEL.FILE-NAME
        INCLUDE CU--VER2 '0096'
            ''':1::2:not in:3:'''
            'CUBOPDA.#PDAX-PHYSICAL-KEY(#I1,#I2)'
      END-IF
    END-FOR
  END-FOR
END-SUBROUTINE /* V_PHYSICAL-KEY
```

CST-STREAM MODEL

This chapter describes the CST-Stream model. This model generates a stream subprogram that converts the contents of a model PDA between internal and streamed format.

The following topics are covered:

Introduction

When deploying a GUI front-end for a module on a Natural Construct client, Natural Construct must be able to translate the specification data passed to the server from the client. To do this, the model requires a stream subprogram to convert the contents of the model PDA into a format that can be transmitted between the client and the server.

If your model generates modules for a Natural Construct client, generate the model PDA and then use the CST-Stream model to generate the stream subprogram.

For more information about generating the model PDA, see **CST-PDA Model**, page 215.

Parameters for the CST-Stream Model

Use the CST-Stream model to generate a stream subprogram for your model. The CST-Stream model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
 CUGTMA                      CST-Stream Subprogram                      CUGTMA0
 Jul 24                       Standard Parameters                        1 of 1
  Module ............. ________
  System ............. C421___________________________


  Title .............. Stream Subprogram .._____
  Description ........ This Stream Subprogram will convert Models:___________
                       (...model name...)____________________________________
                       PDA between internal and streamed formats.____________
                       ______________________________________________________


  Model PDA .......... ________ *
  Generate trace code  _






Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                              userX main
```

Standard Parameters Panel for the CST-Stream Model

The fields on the Standard Parameters panel are:

Field	Description
Module	Name specified on the Generation main menu. The name of the stream subprogram must be alphanumeric and no more than eight characters in length. Use the following naming convention: CX*xx*T where *xx* uniquely identifies your model.
System	Name of the system (by default, the name of the current library). This is a required field. The system name must be alphanumeric and associated with a Natural library ID. (The combination of the module name and system name is used as a key to access help information for the generated module.)
Title	Title for the stream subprogram. The title identifies the generated stream subprogram for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the stream subprogram. The description is inserted in the banner at the beginning of the stream subprogram and is used internally for program documentation.
Model PDA	Name of the PDA used by the model for which you are generating the stream subprogram.
Generate trace code	If this field is marked, extra code is generated into the stream subprogram to help trace inconsistencies between data sent by the client and data expected by the server.

User Exits for the CST-Stream Model

```
 CSGSAMPL                     Natural Construct                         CSGSM0
 Jul 24                           User Exits                             1 of 1
               User Exit              Exists    Sample   Required Conditional
     -------------------------------- -------- ---------- -------- ------------
  _  CHANGE-HISTORY                           Subprogram
  _  LOCAL-DATA
  _  ADDITIONAL-INITIALIZATIONS                Example
  _  END-OF-PROGRAM
```

User Exits Panel for the CST-Stream Model

Note: Normally, this model does not require user exits.

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120 in *Natural Construct Generation User's Manual*.

CST-SHELL MODEL

This chapter describes the CST-Shell model used to generate a template for a model subprogram.

The following topics are covered:

Introduction

The CST-Shell model generates a template for a model subprogram. It is similar to the supplied Shell model (for information about the Shell model, see the **Parameters for the Shell Model**, page 490, *Natural Construct Generation User's Manual*).

The main differences between the CST-Shell model and the Shell model are that the CST-Shell model:

- Uses the Natural Construct V3.4.1 model subprogram structure to generate the model components
- Supports regeneration
- Supports messaging

The CST-Shell model creates a DEFINE DATA ... END-DEFINE framework containing definitions for the global data area (GDA), parameter data areas (PDAs), local data areas (LDAs), or views specified on the Standard Parameters panel. It also includes the required REPEAT loops and messaging subroutines. You can use this time-saving model to generate startup modules for your model subprograms.

For an example of a generated shell program, see the CUMPSLFV subprogram in the SYSCST library.

Parameters for the CST-Shell Model

Use the CST-Shell model to generate a shell program. The CST-Shell model has one specification panel, Standard Parameters, and one user exit panel. These panels are described in the following sections.

Standard Parameters Panel

```
CUGSMA                       CST-Shell Program                    CUGSMA0
Jul 11                      Standard Parameters                    1 of 1

  Module name ........ CXMPSLFV
  Module type ........ _
  System name ........ NCSTDEMO________________________ *

  Title .............. CST module ...___________
  Description ........ This CST module is used for ...________________________
                       ________________________________________________________
  Messaging support .. _
  Global data area ... ________ *
  Parameter data area  ________ ________ ________ ________ ________ *
  Local data area .... ________ ________ ________ ________ ________ *
                       ________ ________ ________ ________ ________ *

  Views ........  1    ________________________________ *
                  2    ________________________________ *
                  3    ________________________________ *
                  4    ________________________________ *
                  5    ________________________________ *
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
main  help  retrn quit                                            userX main
```

Standard Parameters Panel for the CST-Shell Model

The fields on the Standard Parameters panel are:

Field	Description
Module name	Name of the shell program you are creating (by default, the name specified in the Module name field on the Generation main menu). This is a required field. The module name must follow standard Natural naming conventions, must be alphanumeric, and cannot be more than eight characters in length.
Module type	Code for the type of module for which you are creating the shell program. Valid codes are: • P (program) • N (subprogram) • H (helproutine) • S (subroutine)
System name	Name of the system (by default, the name of the current library). This is a required field. The system name must be alphanumeric, no more than 32 characters in length, and does not have to be associated with a Natural library ID. (The combination of the module name and system name is used as a key to access help information for the generated module.)
Title	Title for the shell program. The title identifies the generated shell program for the List Generated Modules function on the Generation main menu and is used internally for program documentation.
Description	Brief description of the shell program. The description is inserted in the banner at the beginning of the shell program and is used internally for program documentation.
Messaging support	If this field is marked, the shell program supports the dynamic translation of messages.

Field	Description (continued)
Global data area	Name of the global data area used by the generated module.
Parameter data area	Names of up to five inline parameter data areas used by the generated module.
Note:	If the Module type is P (program) or S (subroutine), you cannot specify parameter data.
Local data area	Names of up to 10 inline or external local data areas used by the generated module.
Views	Names of up to five Predict views used by the generated module.

User Exits for the CST-Shell Model

```
CSGSAMPL                        CST-Shell Program                        CSGSM0
Oct 10                              User Exits                           1 of 1

               User Exits             Exists    Sample   Required Conditional
    ------------------------------- -------- ---------- -------- ------------
 _  CHANGE-HISTORY                          Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA                                Example
 _  START-OF-PROGRAM
 _  GENERATE-CODE
 _  BEFORE-CHECK-ERROR                       Example
 _  ADDITIONAL-INITIALIZATIONS               Example
 _  END-OF-PROGRAM
```

User Exits Panel for the CST-Shell Model

For more information about user exits, see **Supplied User Exits**, page 305. For information about the User Exit editor, see **User Exit Editor**, page 120 in *Natural Construct Generation User's Manual*.

USER EXITS FOR THE NATURAL CONSTRUCT MODELS

This chapter describes the user exits supplied for the Natural Construct administration models. Administration models generate the model subprograms used by all models.

The following topics are covered:

Introduction

This chapter describes the user exits for the following Natural Construct administration models:

- CST-Clear
- CST-Read
- CST-Save
- CST-Modify and CST-Modify-332
- CST-Pregen
- CST-Postgen
- CST-Frame
- CST-Document
- CST-Validate
- CST-Stream
- CST-Shell

User Exits

User exits insert customized or specialized processing in a Natural Construct-generated module. Changes to the user exit code are always preserved upon regeneration of the module.

Natural Construct models provide a wide variety of user exits. You can select from a list of available exits by entering SAMPLE at the > prompt in the User Exit editor. (For more information, see **Supplied User Exits**, page 305.)

The exits vary depending on the type of module you are generating. Some exits contain sample code or subprograms, while others generate the DEFINE EXIT…END-EXIT lines only — you provide the actual code. You can modify any user exit code generated into the edit buffer.

If you require code to be inserted in a generated module where no user exit currently exists, have your Natural Construct administrator recommend a suitable exit or add a new exit to the model.

Reusing User Exit Code

When you specify a new model on the Generation main menu and the source buffer contains code, you can retain that code and use it with the model you are creating.This functionality saves time and effort when creating modules that use the same code.

If the source buffer contains code when you specify a new model, the following window is displayed:

```
                                 Natural Construct          CSGNEW0
                                 CLEAR Source Area


                 Mark if you wish to clear the source area         _
```

CLEAR Source Area Window

To retain the code in the source buffer for use with the new model, press Enter in this window. The first specification panel for the new model is displayed. Natural Construct retains the user exit code for use with the new module.

To clear the code in the source buffer (and not save it for the new module), enter any non-blank character in the Mark if you wish to clear the source area field. The source buffer is cleared and the first specification panel for the model you are creating is displayed.

Invoking the User Exit Editor

You can invoke the User Exit editor from the Generation main menu (using the User Exit Editor function) or from the last specification panel for a model that supports user exits (by pressing PF11).

To invoke the User Exit editor from the Generation main menu, see **User Exit Editor**, page 120 in *Natural Construct Generation User’s Manual*.

To invoke the User Exit editor from the model specification panels, press PF11 (userX) on the last specification panel for a model that supports user exits:

- If user exits are defined for the specified module, the existing user exit code is displayed in the User Exit editor. (To select additional exits, enter SAMPLE at the > prompt to display the User Exits panel.)
- If no user exits are defined for the specified module, the User Exits panel for the model is displayed.

User Exits Panel

➢ To invoke the User Exits panel from the User Exit editor:

1 Type “SAMPLE” at the > prompt in the User Exit editor.

2 Press Enter.
A selection panel of available user exits for the specified model is displayed. The available user exits vary, depending on what type of module you are generating.

Note: The SAMPLE command is performed automatically when you invoke the User Exit editor and no user exits are defined for the specified module.

The following example shows the first User Exits panel for the CST-Clear model:

```
CSGSAMPL                    CST-Clear Subprogram                    CSGSM0
Oct 09                           User Exits                           1 of 1

              User Exits            Exists    Sample   Required Conditional
    ------------------------------- -------- ---------- -------- ------------
 _  CHANGE-HISTORY                            Subprogram
 _  PARAMETER-DATA
 _  LOCAL-DATA
 _  PROVIDE-DEFAULT-VALUES                    Subprogram
 _  BEFORE-CHECK-ERROR                         Example
 _  ADDITIONAL-INITIALIZATIONS                 Example
 _  END-OF-PROGRAM
```

User Exits for the CST-Clear Model

The fields on the User Exits panel is similar for all models:

Field	Description
User Exits	Names of the user exits available for this model. If a user exit is required and not conditional (its existence is not based on condition codes in the code frames), it is marked by default.
Exists	If the corresponding user exit is defined (exists), “X” is displayed. If the user exit does not exist, this field is blank.
Sample	If the user exit is empty (contains DEFINE EXIT … END-EXIT lines), this field is blank. If the user exit contains a subprogram, “Subprogram” is displayed. If the user exit contains sample code, “Example” is displayed.
Required	If the user exit must be specified, X is displayed. If the user exit is optional, this field is blank.
Conditional	If the user exit is conditional (its existence is based on condition codes in the code frames), X is displayed.

➢ To select a user exit displayed on the User Exits panel:

1 Type an "X" in the input field to the left of each user exit you want to use.

2 Press Enter.
The selected user exits are displayed in the User Exit editor.

You can define user exits directly in the User Exit editor — without using the SAMPLE command, and you can change the generated code as desired. All user exit code is preserved when a module is regenerated. Fully qualify all references to database fields in the user exits with the file name.

Defining User Exits

The code you specify in a user exit depends on the type of module you are generating and the type of user exit you are using. However, all Natural Construct user exits have the following format:

```
0010 DEFINE EXIT user-exit-name
0020   user exit code
0030 END-EXIT user-exit-name
```

Note: Do not insert comments or Natural code on the DEFINE EXIT and END-EXIT lines.

Note: If multiple user exits are generated with the same name, Natural Construct will merge them into a single user exit in the generated module.

Supplied User Exits

The following sections describe the user exits available for the Natural Construct administration models. The sections are listed in alphabetical order, based on the user exit name. For many exits, one or more examples are also included.

ADDITIONAL-INITIALIZATIONS

This user exit generates the framework for any additional initializations performed in the INITIALIZATIONS subroutine.

Example of code generated by the ADDITIONAL-INITIALIZATIONS user exit

```
** SAG DEFINE EXIT ADDITIONAL-INITIALIZATIONS
*
* Assign parameters for help routine CD-HELPR
MOVE  'CU'  TO #MAJOR-COMPONENT
MOVE *PROGRAM   TO  #MINOR-COMPONENT
*
**SAG END-EXIT
*
END-SUBROUTINE /* INITIALIZATIONS
```

ADDITIONAL-SUBSTITUTION-VALUES

This user exit is used in combination with the LOCAL-DATA user exit. It generates STACK statements for code frame parameters that do not have a corresponding variable in the model PDA.

Example of code generated by the ADDITIONAL-SUBSTITUTION-VALUES user exit

```
DEFINE EXIT ADDITIONAL-SUBSTITUTION-VALUES
*
* Substitution for frame parameters that are not defined in the
* model PDA.
STACK TOP DATA FORMATTED '&CENTERED-HEADER1'
                          #CENTERED-HEADER1
STACK TOP DATA FORMATTED '&CENTERED-HEADER2'
                          #CENTERED-HEADER2
STACK TOP DATA FORMATTED '&DATE-EM'
                          #DATE-EM
STACK TOP DATA FORMATTED '&EOD-TABT'
                          #EOD-TABT
STACK TOP DATA FORMATTED '&EXPORT-DELIMITER'
                          #EXPORT-DELIMITER
STACK TOP DATA FORMATTED '&GT-LT'
                          #GT-LT
STACK TOP DATA FORMATTED '&HEAD1-LEN'
                          #HEAD1-LEN
STACK TOP DATA FORMATTED '&HEAD2-LEN'
                          #HEAD2-LEN
STACK TOP DATA FORMATTED '&INPUT-LINES'
                          #INPUT-LINES
STACK TOP DATA FORMATTED '&KEY-PREFIX'
                          #KEY-PREFIX
STACK TOP DATA FORMATTED '&LT-GT'
                          #LT-GT
STACK TOP DATA FORMATTED '&PARM-NAT-FORMAT'
                          #PARM-NAT-FORMAT
STACK TOP DATA FORMATTED '&PREFIX-NAT-FORMAT'
                          #PREFIX-NAT-FORMAT
STACK TOP DATA FORMATTED '&SEL-TBL-SIZE'
                          #SEL-TBL-SIZE
STACK TOP DATA FORMATTED '&TIME-EM'
                          #TIME-EM
STACK TOP DATA FORMATTED '&UQ'
                          #UQ
STACK TOP DATA FORMATTED '&UQ-FOUND'
                          #UQ-FOUND
STACK TOP DATA FORMATTED '&VALUE-UQ'
                          #VALUE-UQ
STACK TOP DATA FORMATTED '&VAR-UQ'
                          #VAR-UQ
```

```
STACK TOP DATA FORMATTED '&VIEW-LDA'
                          #VIEW-LDA
STACK TOP DATA FORMATTED '&WINDOW-WIDTH'
                          #WINDOW-WIDTH
STACK TOP DATA FORMATTED '&WITH-BLOCK'
                          #WITH-BLOCK
END-EXIT ADDITIONAL-SUBSTITUTION-VALUES
```

ADDITIONAL-TRANSLATIONS

This user exit generates the framework for additional translations performed in the GET-PROMPT-TEXT subroutine.

Example of code generated by the ADDITIONAL-TRANSLATIONS user exit

```
**SAG DEFINE EXIT ADDITIONAL-TRANSLATIONS
*
  IF #FIRST-TRANSLATION OR CU--PDA.#PDA-PHASE = CSLPHASE.#TRANSLATE
    THEN
    PERFORM SET-MODIFY-HEADER3
    /*
    /* Set completed message
    RESET CNAMSG.INPUT-OUTPUTS
    ASSIGN CNAMSG.MSG-DATA(1) = #PDA-FRAME-PARM
    ASSIGN CNAMSG.MSG = CUBASRPL.#RETURN-MESSAGE
    PERFORM GET-MESSAGE-TEXT
    ASSIGN CUBASRPL.#RETURN-MESSAGE = CNAMSG.MSG
    RESET CNAMSG.INPUT-OUTPUTS
    /*
    /* Assign available keys
   ASSIGN CU--PDA.#PDA-AVAILABLE1-NAME = #AVAILABLE1-NAME
   ASSIGN CU--PDA.#PDA-AVAILABLE2-NAME = #AVAILABLE2-NAME
   ASSIGN CU--PDA.#PDA-AVAILABLE3-NAME = #AVAILABLE3-NAME
    RESET #FIRST-TRANSLATION
     /*
     /* Override pfkey settings
     RESET #LOCAL-PFKEYS-REQUIRED
     /*
     /* Set all PF-keys named off
     INCLUDE CU--SOFF
     /*
     /* Set Help and Return keys
     SET KEY DYNAMIC CU--PDA.#PDA-PF-HELP = HELP
             NAMED CU--PDA.#PDA-HELP-NAME
     SET KEY DYNAMIC CU--PDA.#PDA-PF-RETURN
             NAMED CU--PDA.#PDA-RETURN-NAME
     END-IF
     **SAG END-EXIT
```

AFTER-INPUT

The code in this exit is executed immediately after each input panel is displayed and the standard keys and direct commands are processed (AT END OF PAGE section). You can use this exit to define validity edits for user-defined fields or to add non-standard PF-key processing to a module.

For example, when you add a non-standard PF-key, you can set the #SCROLLING variable to TRUE so the generated module does not trap the PF-key as invalid. After processing the non-standard key, include the PERFORM NEW-SCREEN code to return to the main panel (main INPUT statement) for the module.

Note: If you do not include the PERFORM NEW-SCREEN code and continue with execution after processing this exit, an Invalid PF-key error message is displayed.

Example of user exit code for the Browse models*

```
DEFINE EXIT AFTER-INPUT
*
* Processing to be performed immediately after the exit checks,
* after input.
IF NOT (#OPTION = ' ' OR = 'M' OR = 'S' OR = 'C') THEN
  REINPUT 'Valid options are "M", "S" or "C" or blank'
  MARK *#OPTION ALARM
END-IF
END-EXIT AFTER-INPUT
```

Example of user exit code for the Object-Maint-Dialog model

```
DEFINE EXIT AFTER-INPUT
  /*
  /* Compute total for current product line
 COMPUTE ORDER.TOTAL-COST(#ARRAY1) = ORDER.QUANTITY(#ARRAY1) *
                                    ORDER.UNIT-COST(#ARRAY1)
END-EXIT AFTER-INPUT
```

AFTER-INVOKE-SUBPANELS

This user exit generates the framework for any processing performed after sub-panels are invoked.

Example of code generated by the AFTER-INVOKE-SUBPANELS user exit

```
0100 DEFINE EXIT AFTER-INVOKE-SUBPANELS
0110   PERFORM SET-MORE-INDICATORS
0120 END-EXIT
```

ASSIGN-DERIVED-VALUES

This user exit generates initialization statements for all #PDA variables in the model PDA. The variables are assigned null default values. You can modify the generated code as desired.

Note: If you add specification parameters to the model PDA, you can get the sample statements for the new parameters by regenerating this user exit. Regeneration adds the new variables, but does not modify code from the previous generation.

Example of code generated by the ASSIGN-DERIVED-VALUES user exit

```
DEFINE EXIT ASSIGN-DERIVED-VALUES
*
* Initialize '#PDA-' parameters in PDA.
  ASSIGN #PDA-FIELD-TYPE = ' '
  ASSIGN #PDA-FIELD-REDEFINED = FALSE
  ASSIGN #PDA-LEVEL-NUMBER = 0
  ASSIGN #PDA-FIELD-FORMAT = ' '
  ASSIGN #PDA-FIELD-LENGTH = 0
  ASSIGN #PDA-UNITS = 0
  ASSIGN #PDA-DECIMALS = 0
  ASSIGN #PDA-FROM-INDEX(*) = 0
  ASSIGN #PDA-THRU-INDEX(*) = 0
  ASSIGN #PDA-FIELD-RANK = 0
  ASSIGN #PDA-FILE-CODE = 0
  ASSIGN #PDA-MAX-LINES = 0
  ASSIGN #PDA-WFRAME = ' '
  ASSIGN #PDA-WLENGTH = ' '
  ASSIGN #PDA-WCOLUMN = ' '
  ASSIGN #PDA-WBASE = ' '
END-EXIT ASSIGN-DERIVED-VALUES
```

BEFORE-CHECK-ERROR

This user exit generates the framework for any processing performed before a standard error check.

Note: When an error condition occurs, the END-OF-PROGRAM user exit is bypassed. If a model subprogram requires processing before leaving the program, use this user exit to specify the processing.

Example of code generated by the BEFORE-CHECK-ERROR user exit

```
**SAG DEFINE EXIT BEFORE-CHECK-ERROR
*
* Use this user exit for specific error checking
  IF CSASTD.RETURN-CODE = CSLRCODE.#INTERRUPT(*)
    ASSIGN C--PDA.#PDA-PHASE = #SAVE-PHASE
  END-IF
 **SAG END-EXIT
```

BEFORE-INPUT

The code in this exit is executed immediately before the INPUT statement is processed in the AT END OF PAGE section. You can use this exit to:

- Look up a code table (to display a description, as well as a code value)
- Issue SET CONTROL statements
- Capture or default map variables prior to displaying each panel

Example of user exit code for the Browse-Select-Subp model

```
DEFINE EXIT BEFORE-INPUT
*
* Processing to be performed before the INPUT statement.
* Change standard message to indicate that selection can be done ONLY
* by positioning the cursor (not entering key value since input is
* protected).
  ASSIGN MSG-INFO.##MSG = 'Position cursor to select.'
END-EXIT BEFORE-INPUT
```

Example of user exit code for the Menu model

```
DEFINE EXIT BEFORE-INPUT
*
* Processing to be performed before each INPUT statement.
  SET CONTROL 'WB'      /* Restore window size to physical screen size.
END-EXIT BEFORE-INPUT
```

Example of user exit code for the Object-Maint-Dialog model

```
DEFINE EXIT BEFORE-INPUT
*
* If order lines were scrolled, set distributions array to 1
  IF #LAST-ARRAY1 NE #ARRAY1 THEN
    ASSIGN #ARRAY2 = #NEXT-ARRAY2 = #CURR-INDEX(#PANEL,2) = 1
  END-IF
  ASSIGN #LAST-ARRAY1 = #ARRAY1
  /*
  /* Update total for the order
  COMPUTE ORDER.ORDER-AMOUNT = 0 + ORDER.TOTAL-COST(*)
END-EXIT BEFORE-INPUT
```

BEFORE-INVOKE-SUBPANELS

This user exit generates the framework for any processing performed before subpanels are invoked.

Example of code generated by the BEFORE-INVOKE-SUBPANELS user exit

```
DEFINE EXIT BEFORE-INVOKE-SUBPANELS
  IF CU--PDA.#PDA-PHASE NE CSLPHASE.#TRANSLATE THEN
    PERFORM VALIDATE-FILE-INFO
  END-IF
END-EXIT
```

BEFORE-REINPUT-MESSAGE

The code in this user exit allows you to interrogate the message codes and override the display logic for the generated messages. For example, if the logic specifies that a message is ignored, you can display the message. If the logic specifies that the program is interrupted, you can terminate the program.

Example of code generated by the BEFORE-REINPUT-MESSAGE user exit

```
END-SUBROUTINE /* INPUT-SCREEN
*
* DEFINE SUBROUTINE REINPUT-MESSAGE
*
**SAG DEFINE EXIT BEFORE-REINPUT-MESSAGE
   IF CSASTD.RETURN-CODE = CSLRCODE.#COMMUNICATION THEN
      ESCAPE BOTTOM(PROG.) IMMEDIATE
   END-IF
**SAG END-EXIT
   DECIDE FOR FIRST CONDITION
      WHEN CSASTD.RETURN-CODE = CSLRCODE.#CONTINUE(*)
             IGNORE
      WHEN CSASTD.RETURN-CODE = CSLRCODE.#INTERRUPT(*)
                  ESCAPE BOTTOM(NEW-SCREEN)
       WHEN NONE
             IGNORE
END-DECIDE
```

BEFORE-STANDARD-KEY-CHECK

The code in this user exit checks any additional PF-keys defined for a modify subprogram or prepares for standard PF-key validations.

Example of code generated by the BEFORE-STANDARD-KEY-CHECK user exit

```
DEFINE EXIT BEFORE-STANDARD-KEY-CHECK
*
* Use this user exit to check additional PF-keys or prepare for the
* standard PF-key check.
END-EXIT BEFORE-STANDARD-KEY-CHECK
```

CHANGE-HISTORY

This user exit keeps a record of changes to the generated module. It generates comment lines indicating the date, the user ID of the user who created or modified the module, and a description of any change.

Example of code generated by the CHANGE-HISTORY user exit

```
DEFINE EXIT CHANGE-HISTORY
* Changed on Aug 27,01 by SAG for release ____
* >
* >
* >
END-EXIT CHANGE-HISTORY
```

DESCRIBE-INPUTS

This user exit contains statements that document specification parameter values (#PDAX variables) in the model PDA. For example, if you are documenting a menu program, this user exit contains the menu function codes and descriptions.

Example of code generated by the DESCRIBE-INPUTS user exit

```
DEFINE EXIT DESCRIBE-INPUTS
*
* Enter other model parameters to be documented.
* Use WRITE statements of the following format:
*     WRITE(SRC) NOTITLE LDA.#Variable-name #PDAX-variable-name
END-EXIT DESCRIBE-INPUTS
```

END-OF-PROGRAM

The code in this exit is executed once before the module is terminated. You can use this exit for any cleanup required (such as assigning a termination message or resetting windows) before exiting the module.

Note: You can assign the current key value to a global variable in this exit, so it is carried into other modules that use the same key.

Note: If an error condition occurs, this user exit will not be executed. Use the BEFORE-CHECK-ERROR user exit if processing is required before leaving the program.

Example of user exit code for the Object-Subp model

```
DEFINE EXIT END-OF-PROGRAM
FOR #I = 1 TO 3
* Strip Ncst off of file name references in messages.
 IF MSG-INFO.##MSG-DATA(#I) = MASK('Ncst ') THEN
  RESET MSG-INFO.##MSG-DATA-CHAR(#I,1:4)
  MOVE LEFT MSG-INFO.##MSG-DATA(#I) TO MSG-INFO.##MSG-DATA(#I)
 END-IF
END-FOR
END-EXIT END-OF-PROGRAM
```

GENERATE-CODE

This user exit generates the framework for any code generated by a model subprogram.

Example of code specified in the GENERATE-CODE user exit

```
DEFINE EXIT GENERATE-CODE
*
  RESET CSASELFV CSASELFV.GENERAL-INFORMATION
                 CSASELFV.FIELD-SPECIFICATION(*)
  MOVE CUMPPDA.#PDAX-VIEW-LPDA-STRUCT-NAME(*) TO
                                    CSASELFV.#VIEW-LPDA-STRUCT-NAME(*)
  MOVE CUMPPDA.#PDAX-FIELD-NAME(*) TO CSASELFV.FIELD-NAME(*)
  MOVE CUMPPDA.#PDAX-FIELD-FORMAT(*) TO CSASELFV.FIELD-FORMAT(*)
  MOVE CUMPPDA.#PDAX-FIELD-LENGTH(*) TO CSASELFV.FIELD-LENGTH(*)
  FOR #I = 1 TO #MAX-FLDS
    MOVE CUMPPDA.#PDAX-MAX-OCCURS(#I) TO
                                    CSASELFV.FIELD-OCCURRENCES(#I,1)
  END-FOR
  MOVE CUMPPDA.#PDAX-STRUCTURE-NUMBER(*) TO
                                      CSASELFV.#STRUCTURE-NUMBER(*)
  MOVE CUMPPDA.#PDAX-FIELD-PROMPT-OR-TEXT(*) TO
                                      CSASELFV.FIELD-HEADINGS(*)
  ASSIGN CSASELFV.#ARRAY-RANK-SELECTED = 1
  CALLNAT 'CSUSELFV' CSASELFV
                     CU--PDA
                     CSASTD
  ASSIGN CSASTD.ERROR-FIELD-INDEX1 = CSASELFV.#ERROR-FIELD-INDEX
  PERFORM CHECK-ERROR
  RESET CSASTD.ERROR-FIELD-INDEX1
  MOVE CSASELFV.FIELD-NAME(*) TO CUMPPDA.#PDAX-FIELD-NAME(*)
  MOVE CSASELFV.FIELD-FORMAT(*) TO CUMPPDA.#PDAX-FIELD-FORMAT(*)
  MOVE CSASELFV.FIELD-LENGTH(*) TO CUMPPDA.#PDAX-FIELD-LENGTH(*)
  MOVE CSASELFV.#STRUCTURE-NUMBER(*) TO
                                  CUMPPDA.#PDAX-STRUCTURE-NUMBER(*)
  MOVE CSASELFV.FIELD-HEADINGS(*) TO
                                  CUMPPDA.#PDAX-FIELD-PROMPT-OR-TEXT(*)
  MOVE CSASELFV.#VIEW-LPDA-STRUCT-NAME(*) TO
                                CUMPPDA.#PDAX-VIEW-LPDA-STRUCT-NAME(*)
  FOR #I = 1 TO #MAX-FLDS
    MOVE CSASELFV.FIELD-OCCURRENCES(#I,1)
      TO CUMPPDA.#PDAX-MAX-OCCURS(#I)
    EXAMINE CUMPPDA.#PDAX-FIELD-PROMPT-OR-TEXT(#I) FOR '/'
      REPLACE WITH ' '
  END-FOR
END-EXIT GENERATE-CODE
```

GENERATE-SUBROUTINES

This user exit generates the framework for validations performed by the model validation subprogram. It is used in conjunction with the GENERATE-VALIDATIONS user exit and is available for modules generated using the CST-Validate model. For more information, refer to **CST-Validate Model**, page 281.

In this user exit, code validations as subroutines. For each #PDAX-*FIELD-NAME* field you want to validate, create a subroutine called V-*field-name* to perform the validations. Whenever a validation error is found, the V-*field-name* subroutine must:

- Assign CSASTD.RETURN-CODE = 'E'
- Assign the error message in CSASTD.MSG
- Perform an ESCAPE-ROUTINE to bypass subsequent checks

To retrieve SYSERR messages, use the CU--VERR copycode.

For information about coding validations for array fields, refer to **Validating Array Fields**, page 286.

GENERATE-VALIDATIONS

This user exit generates the framework for validations performed by the model validation subprogram. It is used in conjunction with the GENERATE-SUBROUTINES user exit and is available for modules generated using the CST-Validate model. For more information, refer to **CST-Validate Model**, page 281.

INPUT-ADDITIONAL-PARAMETERS

This user exit contains an INPUT statement to read parameters that are not automatically included in a read subprogram.

Example of code generated by the INPUT-ADDITIONAL-PARAMETERS user exit

```
DEFINE EXIT INPUT-ADDITIONAL-PARAMETERS
*
* Input all other parameters..
*
*   /* Input parameter SAMPLE
*   WHEN #LINE = 'SAMPLE:'
*     INPUT CXMYPDA.#PDAX-SAMPLE
END-EXIT INPUT-ADDITIONAL-PARAMETERS
```

INPUT-SCREEN

This user exit generates code to input screens (maps) for a modify subprogram.

Example of code generated by the INPUT-SCREEN user exit

```
DEFINE EXIT INPUT-SCREEN
IF CSASTD.RETURN-CODE = CSLERROR.#OK OR = CSLERROR.#WARNING
  INPUT WITH TEXT CSASTD.MSG
    MARK POSITION CSAMARK.ERROR-COLUMN IN CSAMARK.ERROR-POS
    USING MAP 'map'
ELSE
  INPUT WITH TEXT CSASTD.MSG
    MARK POSITION CSAMARK.ERROR-COLUMN IN CSAMARK.ERROR-POS
    ALARM
    USING MAP 'map'
END-IF
END-EXIT INPUT-SCREEN
```

LOCAL-DATA

The code in this exit defines additional local variables that are used in conjunction with other user exits. If you are using this user exit with either a Browse, Browse-Select, or Object-Browse series model, a window is displayed from which you can select an option.

Using with a Browse*/Browse-Select*/Object-Browse* Model

If you specify a view name on a Browse*/Browse-Select*/Object-Browse* model specification panel, you must define the view for the file. Mark the LOCAL-DATA user exit and press Enter to display the LOCAL-DATA User Exit window:

```
CUSCSLDA              Natural Construct
Aug 29               LOCAL-DATA User Exit              1 of 1

Define View of Primary File ..  _
Define Local Using Data Area .  ________
```

LOCAL-DATA User Exit Window

Note: Sample code is available in this exit.

To define the entire primary file view in the user exit, mark the Define View of Primary File field and press Enter. You can then edit the sample code and delete the fields you do not want.

If the view is defined in a local data area (LDA), enter the name of the LDA in the Define Local Using Data Area field.

Note: If you are using the LOCAL-DATA user exit with a model other than a Browse, Browse-Select, or Object-Browse series model, the LOCAL-DATA User Exit window is not displayed.

Example of user exit code in the LOCAL-DATA user exit

```
DEFINE EXIT LOCAL-DATA
  LOCAL
  01 #CITY-PROVINCE(A50)
  01 NCST-CUSTOMER VIEW OF NCST-CUSTOMER
    02 CUSTOMER-NUMBER
    02 BUSINESS-NAME
    02 PHONE-NUMBER
    02 SHIPPING-ADDRESS
      03 S-STREET
      03 S-CITY
      03 S-PROVINCE
      03 S-POSTAL-CODE
    02 CONTACT
    02 CREDIT-RATING
    02 CREDIT-LIMIT
END-EXIT LOCAL-DATA
```

Example of user exit code for the Browse-Select model

```
DEFINE EXIT LOCAL-DATA
  01 NCSTDB2-CUSTOMER-PROGRAM-VIEW VIEW OF NCSTDB2-CUSTOMER
  02 CUSTOMER_NUMBER
  02 BUSINESS_NAME
  02 PHONE_NUMBER
  02 M_STREET
  02 M_CITY
  02 N@M_CITY
  02 REDEFINE N@M_CITY
      03 FILLER-90(A1)
      03 N#M_CITY(L)
  02 M_PROVINCE
  02 M_POSTAL CODE
  02 S_STREET
  02 S_CITY
  02 S_PROVINCE
  02 S_POSTAL CODE
  02 CONTACT
  02 PROVINCE
  02 M_CITY
  02 N@M_CITY
  02 REDEFINE N@M_CITY
      03 FILLER-90(A1)
      03 N#M_CITY(L)
  02 M_PROVINCE
  02 M_POSTAL CODE
  02 S_STREET
  02 S_CITY
  02 S_PROVINCE
  02 S_POSTAL CODE
  02 CONTACT
  02 CREDIT_RATING
  02 CREDIT_LIMIT
  02 DISCOUNT_PERCENTAG
  02 CUSTOMER_WAREHOUSE
  02 LOG_COUNTER
END-EXIT LOCAL-DATA
```

MISCELLANEOUS-SUBROUTINES

This user exit generates the framework for any additional subroutines used by a modify subprogram.

Example of code generated by the MISCELLANEOUS-SUBROUTINES user exit

```
DEFINE EXIT MISCELLANEOUS-SUBROUTINES
**
************************************************************************
DEFINE SUBROUTINE subroutine-name
************************************************************************
**
  ESCAPE ROUTINE IMMEDIATE
END-SUBROUTINE /* subroutine-name
END-EXIT MISCELLANEOUS-SUBROUTINES
```

MISCELLANEOUS-VARIABLES

This user exit generates code to write the prompt and field values to Predict. To generate the correct code, translation LDAs must adhere to the following naming standards:

Field Name	Prompt
#PDA-GEN-PROGRAM	CUMNMAL.#GEN-PROGRAM
#PDAX-TITLE	CUMNMAL.#TITLE

Example of code generated by the MISCELLANEOUS-VARIABLES user exit

```
DEFINE EXIT MISCELLANEOUS-VARIABLES
****************************************************************
DEFINE SUBROUTINE MISCELLANEOUS
****************************************************************
*
  WRITE(SRC) NOTITLE 20T CU--DOCL.#MISC-SPECIFICATIONS
  WRITE(SRC) NOTITLE    CU--PDA.#PDA-UNDERSCORE-LINE (AL=70)
  WRITE(SRC) NOTITLE ' '
END-SUBROUTINE /* MISCELLANEOUS
END-EXIT
```

PARAMETER-DATA

This user exit generates the framework to process any additional parameters used in conjunction with other programs.

Example of code generated in the PARAMETER-DATA user exit

```
DEFINE EXIT PARAMETER-DATA
** PARAMETER USING PDAname
** PARAMETER
**  01 #Additional-parameter1
**  01 #Additional-parameter2
END-EXIT PARAMETER-DATA
```

PF-KEYS

This user exit documents information about PF-keys supported by a generated subprogram. To document information about PF-keys, mark this exit and press Enter. A window is displayed, in which you can specify the supported PF-keys. Descriptions of the specified keys are added to Predict.

Example of code generated by the PF-KEYS user exit

```
* Translate pfkey functions
  PERFORM GET-CDKEYFL-TEXT
*
* Write pfkey names and functions
  PRINT(SRC) NOTITLE / 20T CU--DOCL.#PFKEY-SUPPORT
    / ' '
   / 3T CU--DOCL.#PFKEY 14T CU--DOCL.#FUNCTION
   / 3T CU--PDA.#PDA-UNDERSCORE-LINE (AL=10)
        CU--PDA.#PDA-UNDERSCORE-LINE (AL=60)
    / 3T CDKEYLDA.#KEY-NAME(2)
     14T CDKEYFL.#KEY-FUNCTION(2)
END-SUBROUTINE /* PF-KEYS
END-EXIT
DEFINE EXIT PF-KEYS
*****************************************************************
DEFINE SUBROUTINE PF-KEYS
*****************************************************************
*
* Translate pfkey names
  INCLUDE CU--DOC
*
* Translate pfkey functions
  PERFORM GET-CDKEYFL-TEXT
*
* Write pfkey names and functions
  PRINT(SRC) NOTITLE / 20T CU--DOCL.#PFKEY-SUPPORT
    / ' '
   / 3T CU--DOCL.#PFKEY 14T CU--DOCL.#FUNCTION
   / 3T CU--PDA.#PDA-UNDERSCORE-LINE (AL=10)
        CU--PDA.#PDA-UNDERSCORE-LINE (AL=60)
    / 3T CDKEYLDA.#KEY-NAME(3)
     14T CDKEYFL.#KEY-FUNCTION(3)
END-SUBROUTINE /* PF-KEYS
END-EXIT
```

PROCESS-SPECIAL-KEYS

This user exit is required for the CST-Modify-332 model if the generated modify subprogram supports special PF-keys (all keys other than Enter and the help, return, quit, right, and left PF-keys).

Define the special PF-keys on the Maintain Subprograms panel. For a description of this panel, see **Maintain Subprograms Function**, page 61. After defining the keys and generating the model, this user exit contains code you can use as a starting point for processing the keys.

Example of code generated by the PROCESS-SPECIAL-KEYS user exit

```
DEFINE EXIT PROCESS-SPECIAL-KEYS
  ASSIGN #PF-KEY = *PF-KEY
  DECIDE ON FIRST VALUE OF *PF-KEY
    VALUE #PF-*0039
      /*
      /* Perform *0039 processing
      ASSIGN CSASTD.MSG = '*0039 processing completed successfully'
      ESCAPE TOP
    NONE VALUE
      IF *PF-KEY NE 'ENTR'
        REINPUT 'Invalid key:1:entered',#PF-KEY
      END-IF
  END-DECIDE
END-EXIT PROCESS-SPECIAL-KEYS
```

PROVIDE-DEFAULT-VALUES

This user exit provides a list of default values for model parameters. If desired, it can also supply values for other parameters you want to initialize. Natural Construct provides default values for the #PDAX variables in the model PDA.

Note: To specify default values for additional specification parameters in your model PDA, regenerate this user exit. This adds the new variables but does not modify the code from the previous generation.

Example of code generated by the PROVIDE-DEFAULT-VALUES user exit

```
DEFINE EXIT PROVIDE-DEFAULT-VALUES
  ASSIGN CXMNPDA.#PDAX-DESCS(*) = ' '
  ASSIGN CXMNPDA.#PDAX-USE-MSG-NR = FALSE
  ASSIGN CXMNPDA.#PDAX-PDA = ' '
  ASSIGN CXMNPDA.#PDAX-FILE-NAME = ' '
  ASSIGN CXMNPDA.#PDAX-FIELD-NAME = ' '
  ASSIGN CXMNPDA.#PDAX-MAP-NAME = ' '
  ASSIGN CXMNPDA.#PDAX-LINES-PER-SCREEN = 0
  ASSIGN CXMNPDA.#PDAX-WINDOW-BASE = ' '
  ASSIGN CXMNPDA.#PDAX-WINDOW-BASE-LINE = 0
  ASSIGN CXMNPDA.#PDAX-WINDOW-BASE-COLUMN = 0
  ASSIGN CXMNPDA.#PDAX-WINDOW-SIZE = ' '
  ASSIGN CXMNPDA.#PDAX-WINDOW-LINE-LENGTH = 0
  ASSIGN CXMNPDA.#PDAX-WINDOW-COLUMN-LENGTH = 0
  ASSIGN CXMNPDA.#PDAX-WINDOW-FRAME = FALSE
END-EXIT PROVIDE-DEFAULT-VALUES
```

SAVE-PARAMETERS

This user exit is required for the CST-Save model. It generates a WRITE statement for each specification parameter (#PDAX variable) in the model PDA. Elements of array variables are written individually, including the number of array occurrences. The WRITE statement has the following format:

```
WRITE(SRC) NOTITLE '=' #PDAX-variable-name
```

Natural Construct transforms these lines as follows:

```
**SAG variable name: variable contents
```

and writes them at the beginning of Natural Construct-generated modules.

Note: If you add specification parameters to the model PDA, regenerate this user exit to generate the WRITE statements for the new parameters. Regeneration adds the new variables but does not modify code from the previous generation.

Example of code generated by the SAVE-PARAMETERS user exit

```
DEFINE EXIT SAVE-PARAMETERS
FOR #I = 1 TO 4
  IF #PDAX-DESCS(#I) NE ' ' THEN
    COMPRESS '#PDAX-DESCS(' #I '):' INTO #TEXT
    LEAVING NO
    PRINT(SRC) NOTITLE #TEXT #PDAX-DESCS(#I)
  END-IF
END-FOR
WRITE(SRC) NOTITLE '=' #PDAX-USE-MSG-NR
  / '=' #PDAX-PDA
  / '=' #PDAX-FILE-NAME
  / '=' #PDAX-FIELD-NAME
  / '=' #PDAX-MAP-NAME
  / '=' #PDAX-LINES-PER-SCREEN
  / '=' #PDAX-WINDOW-BASE
  / '=' #PDAX-WINDOW-BASE-LINE
  / '=' #PDAX-WINDOW-BASE-COLUMN
  / '=' #PDAX-WINDOW-SIZE
  / '=' #PDAX-WINDOW-LINE-LENGTH
  / '=' #PDAX-WINDOW-COLUMN-LENGTH
  / '=' #PDAX-WINDOW-FRAME
END-EXIT SAVE-PARAMETERS
```

SET-CONDITION-CODES

This user exit is required for the CST-Pregen model. It generates initialization statements for all conditions (#PDAC variables) in the model PDA. You can modify the generated code as desired.

A condition is set to true when a variable corresponding to the condition exists in the model PDA and has a non-null value. The variables and conditions are linked through their names. For example, the #PDAX-*name* variable corresponds to the #PDAC-*name* or #PDAC-*name*-SPECIFIED condition.

For example, if the model PDA contains:

- #PDAX-USE-MSG-NR(L) variable
- #PDAC-USE-MSG-NR(L) condition

this user exit generates the following code:

```
WHEN #PDAX-USE-MSG-NR NE FALSE
   #PDAC-USE-MSG-NR = TRUE
```

If the model PDA contains:

- #PDAX-GDA(A8) variable
- #PDAC-GDA-SPECIFIED(L) condition

this user exit generates the following code:

```
WHEN #PDAX-GDA NE ' '
   #PDAC-GDA-SPECIFIED = TRUE
```

The WHEN clause is blank for all conditions that have no corresponding variable in the model PDA.

Code for the conditions currently existing in this user exit is not generated. When you regenerate this user exit, only the code for new conditions (that were added to the model PDA after the previous generation) is added.

Example of code generated by the SET-CONDITION-CODES user exit

```
DEFINE EXIT SET-CONDITION-CODES
*
* Set conditions in PDA.
  DECIDE FOR EVERY CONDITION
    WHEN #PDAX-USE-MSG-NR NE FALSE
      ASSIGN #PDAC-USE-MSG-NR = TRUE
    WHEN #PDAX-FILE-NAME NE ' '
      ASSIGN #PDAC-FILE-NAME-SPECIFIED = TRUE
    WHEN #PDAX-FIELD-NAME NE ' '
      ASSIGN #PDAC-FIELD-NAME-SPECIFIED = TRUE
    WHEN #PDAX-PDA NE ' '
      ASSIGN #PDAC-PDA-SPECIFIED = TRUE
    WHEN NONE
       IGNORE
  END-DECIDE
END-EXIT
```

START-OF-PROGRAM

The code in this user exit is executed once at the beginning of the generated subprogram after all standard initial values are assigned. You can use this exit to do any initial setup required (such as initializing input values from globals, setting window or page sizes, or capturing security information for a restricted data area).

SUBSTITUTION-VALUES

This user exit is used by the CST-Postgen model, which generates the post-generation subprogram for a model. The post-generation subprogram generates STACK statements for substitution variables in the model PDA. To generate STACK statements for any substitution variables that are not in the model PDA, select the SUBSTITUTION-VALUES or ADDITIONAL-SUBSTITUTION-VALUES user exit (see below for a comparison).

If you select this user exit, STACK statements for all substitution variables are generated in this user exit — those in the model PDA, as well as any additional variables. You can modify these variables as desired.

Which user exit you select depends on whether you want the model to stack substitution parameters in the code frame or in a user exit, thereby overriding the default substitution parameter handling.

- If you use the ADDITIONAL-SUBSTITUTION-VALUES user exit (or no user exit), the model will automatically stack any model PDA variables that match the &SUBSTITUTION values in the code frame. For example:

  ```
  STACK TOP DATA FORMATTED '&PRIME-FILE' #PDAX-PRIME-FILE
  ```

- If you use this user exit, code all substitution values in the user exit since default code will not be generated.

Note: Use either the SUBSTITUTION-VALUES user exit or the ADDITIONAL-SUBSTITUTION-VALUES user exit, but not both.

VALIDATE-DATA

The code in this user exit performs edit checks on each parameter on a maintenance map. Specify the map name in the Map name field on the Standard Parameters panel.

The following sections contain examples of user exit code for the CST-Modify model and CST-Modify-332 model. The CST-Modify model supports dynamic multilingual specification panels and messages using SYSERR references and substitution variables. The code generated by this user exit contains SYSERR numbers and substitution values.

Example user exit code generated for the CST-Modify model

```
DEFINE EXIT VALIDATE-DATA
  DECIDE FOR EVERY CONDITION
    WHEN #HEADER1 = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #HEADER1
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      '#HEADER1'
    WHEN #HEADER2 = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #HEADER2
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      '#HEADER2'
    WHEN #PDA-GEN-PROGRAM = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GEN-PROGRAM
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      '#PDA-GEN-PROGRAM'
    WHEN #PDA-SYSTEM = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #SYSTEM
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      '#PDA-SYSTEM'
    WHEN #PDA-TITLE = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #TITLE
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      '#PDA-TITLE'
```

```
    WHEN CUBAPDA.#PDAX-DESCS = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #DESCS
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAPDA.#PDAX-DESCS'
    WHEN CUBAPDA.#PDAX-GDA = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GDA
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAPDA.#PDAX-GDA'
    WHEN CUBAPDA.#PDAX-GDA-BLOCK = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GDA-BLOCK
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAPDA.#PDAX-GDA-BLOCK'
    WHEN CUBAMAL.#DESCRIPTION = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #DESCRIPTION
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#DESCRIPTION'
    WHEN CUBAMAL.#GDA = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GDA
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#GDA'
    WHEN CUBAMAL.#GDA-BLOCK = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GDA-BLOCK
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#GDA-BLOCK'
    WHEN CUBAMAL.#GEN-PROGRAM = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #GEN-PROGRAM
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#GEN-PROGRAM'
    WHEN CUBAMAL.#SYSTEM = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #SYSTEM
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#SYSTEM'
    WHEN CUBAMAL.#TITLE = ' '
      ASSIGN CNAMSG.MSG-DATA(1) = #TITLE
      INCLUDE CU--RMSG '2001'
      ''':1::2::3:is required'''
      'CUBAMAL.#TITLE'
END-EXIT
```

Example user exit code generated for the CST-Modify-332 model

```
DEFINE EXIT VALIDATE-DATA
*
* Edit checks on map parameters.
  DECIDE FOR EVERY CONDITION
    WHEN #HEADER1 = ' '
      REINPUT 'Header1 is required'
      MARK *#HEADER1 ALARM
    WHEN #HEADER2 = ' '
      REINPUT 'Header2 is required'
      MARK *#HEADER2 ALARM
    WHEN CDDIALDA.#PROGRAM = ' '
      REINPUT 'Program is required'
      MARK *CDDIALDA.#PROGRAM ALARM
    WHEN CDGETDCA.#DIRECT-COMMAND = ' '
      REINPUT 'Direct Command is required'
      MARK *CDGETDCA.#DIRECT-COMMAND ALARM
    WHEN NONE IGNORE
  END-DECIDE
END-EXIT VALIDATE-DATA
```

The basic structure of this user exit is supplied in the above format. You can edit the supplied code as required.

Note: If you add specification parameters to the model PDA, you can generate sample statements for the new parameters by regenerating this user exit. Regeneration adds the new variables but does not modify code from the previous generation.

MODIFYING THE SUPPLIED MODELS

This chapter describes how to modify the models supplied by Natural Construct. In most cases, the existing model can be customized by modifying the code frames associated with the model or the copycode members used in the generated modules. In some cases, the generated code may need to be modified by the subprograms in the model code frames (identified by the CU prefix).

The following topics are covered:

Introduction

The source code for all CU-prefixed subprograms is supplied with Natural Construct. To reduce dependencies between Predict and the Natural Construct models, all models use external subprograms to access the Predict data dictionary (they do not access Predict directly).

Do not modify the supplied model subprograms, as changes to these subprograms may have to be reapplied with each new release of Natural Construct. If you want to modify supplied subprograms, copy the subprogram and use a CX prefix (rather than the CU prefix) to name it.

Additionally, do not modify the supplied code frames. All supplied code frames end with a suffix value of 9 (for example, CMNA9). To create a custom code frame, copy and rename the supplied code frame with a lower suffix value (for example, CMNA7) and modify the new code frame. Natural Construct searches for and uses the code frame with the lowest suffix value when the program is generated. Document all changes so they can be reapplied to subsequent versions of Natural Construct. For more information, see **Maintain Models Function**, page 48**.**

Note: If the changes are confined to model subprograms or copycode members used in modules generated by the model, use the multiple steplib feature to customize the model. For more information, see **Using Steplibs to Modify Models**, page 345.

Modify the Supplied Models

Typically, the Natural Construct administrator modifies generation models. Before a modified model is available for general use, it should be thoroughly tested.

The following sections explain how to modify the supplied model code frames, subprograms, and copycode, as well as how to modify the external data areas and subprograms used by the generation models.

Modifying Code Frames

Do not modify the supplied code frames. Instead, copy the code frames you want to customize and modify these. Keep the original code frames so they can be referred to if problems arise. Changes to code frames take effect immediately after the code frame is saved.

Note: Document all modifications to the code frames so changes can be reapplied to new versions of Natural Construct.

➢ To modify a code frame:

1 Copy the code frame and use an X prefix to name the copy.
For example, the CFEXAM9 code frame becomes XFEXAM9.

Note: Rather than copying and renaming individual model components, you can create standard, development, and production versions of all Natural Construct system files. Use the CSFUNLD and CSFLOAD utilities to move code frames between files.

2 Copy the model that uses the modified code frame and give the copy a different name.
For example, the Menu model becomes Menu2.

3 Invoke the model copy to test changes to your code frame.
For example, invoke the Menu2 model. You can test the modified code frame without interrupting the use of the Menu model.

4 Change the X prefix back to a C and change the 9 in the last position of the code frame name to a lesser number (from 1 to 7).
For example, the XFEXAM9 code frame becomes CFEXAM7. Natural Construct always uses the code frame ending with the lesser number.

Note: Do not use the number 8 in the last position of the code frame name. Number 8 is reserved for future changes to the supplied code frames (should they be issued). For more information about modifying code frames, see **Parameters Supplied by Nested Code Frames**, page 129.

Modifying the Model Subprograms

Because the production copies of the model subprograms are invoked from the SYSLIBS library, you can modify and test the model subprograms within the SYSCST library without affecting existing users of the model.

To invoke Natural Construct from the SYSCST library (instead of the SYSTEM library), use the CSTG command (not NCSTG).

➢ To modify a supplied model subprogram (prefixed by CU):

1 Copy the subprogram and change the CU prefix to CX.

2 Copy the corresponding model and refer the copy to the new CX subprogram.

Note: Use the CSUTEST utility to test the model subprograms individually. For more information, see **Testing the Model Subprograms**, page 178.

3 After testing the model subprograms in the SYSCST library, copy the modified modules to the SYSLIBS library in the FNAT system file.
If you change the condition codes in the model PDA, copy the object code for the model PDA into the SYSLIBS library as well.

Note: If Natural Construct is invoked from a steplib, you do not have to rename the supplied subprograms during modification and testing. Instead, copy the subprogram to a test library or other higher level steplib. Once tested, you can copy the modules to the steplib reserved by all development libraries for modifying the supplied modules.

Modifying Copycode (CC*) and External Data Areas and Subprograms (CD*)

If you modify any of the CC or CD-prefixed supplied modules and want to apply the changes to programs generated in all libraries, copy the modified modules to the SYSTEM library. If the changes only apply to one application, copy the modified modules to the corresponding application library.

If you modify the CC or CD-prefixed modules and assign a new name to the modified modules, reference the new name in the Natural Construct standard models. For example, if you modify CCSTDKEY and name the new module MYSTDKEY, refer the Natural Construct standard models to MYSTDKEY instead of CCSTDKEY.

The supplied CSXCNAME user exit subprogram in the SYSCSTX library allows users to substitute their own symbols or names for the default values generated into a Natural Construct object (CC* copycode and CD* routines, for example). If this subprogram exists in the SYSLIBS library, it is invoked immediately before the post-generate subprogram for the current model.

The main function of the CSXCNAME subprogram is to place a list of substitution symbols and values on the Natural stack. For example, if you enter the following code in CSXCNAME:

```
STACK TOP DATA FORMATTED 'CCSTDKEY' 'MYSTDKEY'
```

Natural Construct scans for “CCSTDKEY” and replaces it with “MYSTDKEY”.

Example of Modifying a Model

This section describes how to modify the maintenance model (Maint). The modifications include the option to generate depth scrolling capabilities, in addition to the current up-down and left-right scrolling. This capability allows a user to scroll a three-dimensional array using the PF4 and PF5 keys. Additionally, the user can name these keys on the second specification panel.

➢ To implement this feature:

1 Determine what modifications are required by manually applying the changes to a maintenance program generated by the model.
The modified program is the prototype. To identify which code frames, PDA, and subprograms to modify, invoke the Maintain Models panel and display information for the Maint model.

2 Modify the parameter data area (PDA) as follows:

– Copy the PDA and change the "CU" prefix to "CX".

– Add a #PDAC-DEPTH-KEYS logical variable to the end of the redefinition of #PDA-CONDITION-CODES.

– Add a #PDAX-DEPTH-KEYS logical variable to the end of the redefinition of #PDA-USER-AREA.

– Add two A5 fields (#PDAX-DEPTH-IN and #PDAX-DEPTH-OUT, for example).

– Stow the modified PDA in the SYSCST library.

Note: If you are executing the steplib version of Natural Construct, move the model PDA to a lower level steplib and make the changes without renaming the object.

3 Modify the second maintenance map and subprogram as follows:

Tip: The subprogram name is displayed in the top left corner of a panel; the map name is displayed in the top right corner of a panel.

– Copy the current versions and change the "CU" prefix in the names to "CX".

– Add the #PDAX-DEPTH-KEYS, #PDAX-DEPTH-IN, and #PDAX-DEPTH-OUT fields to the new map. For example:

```
Include Depth Keys: _ (Named: _____ and _____)
```

– Stow the new map and subprogram.

Note: Validation edits (ensuring the keys are named if they are included, for example) can be initiated on the map or within the invoking subprogram.

4 Modify the code frames as follows:

– Identify the code frames to modify.
The easiest way to do this is by marking the Options field when generating a program using the Maint model. When the Status window is displayed, mark the Embedded statements option. The generated program will then contain comments showing where each code block originated.

– Copy the code frames and change the “C” prefixes to “X”.

– Modify the X code frames in the DEPTH-KEYS condition.
You can name the keys using substitution parameters assigned in the post-generate subprogram. For example:

```
DEPTH-KEYS1
SET KEY CDKEYLDA.#DEPTH-IN-KEY NAMED “&DEPTH-IN'                "
SET KEY CDKEYLDA.#DEPTH-OUT-KEY NAMED “&DEPTH-OUT'              "
```

– Save the code frame.

– Make a test copy of the model and have the test model refer to the X copies.

Note: Add the new PF-keys to CDKEYLDA. For information, see **Adding a New PF-Key**, page 157, in *Natural Construct Generation User’s Manual*.

5 Modify the model subprograms as follows:

– Make copies using an “X” prefix (or use a steplib).

– Modify the clear subprogram to initialize the new parameters. For example:

```
RESET #PDAX-DEPTH-KEYS
ASSIGN #PDAX-DEPTH-IN = 'front'
ASSIGN #PDAX-DEPTH-OUT = 'back'
```

- Modify the pre-generation subprogram to assign the #PDAC-DEPTH-KEYS logical condition variable to TRUE if the user marks the #PDAX-DEPTH-KEYS field.
- Modify the post-generation subprogram to assign the names of the depth keys. For example:

```
IF #PDAC-DEPTH-KEYS THEN
  STACK TOP DATA FORMATTED '&DEPTH-IN' #PDAX-DEPTH-IN
  STACK TOP DATA FORMATTED '&DEPTH-OUT' #PDAX-DEPTH-OUT
END-IF
```

- Modify the save subprogram to write the new parameters. For example:

```
IF #PDAC-DEPTH-KEYS THEN
  WRITE(SRC) NOTITLE '=' #PDAX-DEPTH-KEYS
  WRITE(SRC) NOTITLE '=' #PDAX-DEPTH-IN
  WRITE(SRC) NOTITLE '=' #PDAX-DEPTH-OUT
END-IF
```

- Modify the read subprogram to accept the new parameters. For example:

```
WHEN #LINE = 'DEPTH-KEYS:'
  INPUT #PDAX-DEPTH-KEYS
WHEN #LINE = 'DEPTH-IN:'
  INPUT #PDAX-DEPTH-IN
WHEN #LINE = 'DEPTH-OUT:'
  INPUT #PDAX-DEPTH-OUT
```

6 Test the modified model in the SYSCST library using the CSTG command. You can also test individual components of the model using the CSUTEST program or debug the model using the trace options available through the Generation main menu (for more information, see **Testing the Model Subprograms**, page 178).

7 Migrate the modified model as follows:

- Copy the modules for the modified subprograms and PDA from the SYSCST library to the SYSLIBS library.
- Modify the model definition record (Maintain Models panel) to refer to the modified code frame.

8 Document all modifications to the model in case they have to be applied to a future version of Natural Construct.

Using Steplibs to Modify Models

Using Natural Security, you can define up to eight steplibs for each Natural Construct library. The searching order is the current library (*LIBRARY), the first steplib (if present), the second steplib (if present), …, the eighth steplib (if present), and then the SYSTEM library.

If you store the executing Natural Construct modules in a steplib, you can store your modified model subprograms or copycode in a higher level steplib, effectively overriding any supplied Natural Construct modules with the same names and types. In this way, users access your modified models and the supplied models remain untouched.

When you invoke Natural Construct from a steplib, use the CSTG command (as in the SYSCST library) — not the NCSTG command. The NCSTG command always invokes the copy of Natural Construct that is stored in the SYSLIBS library and bypasses the steplibs. To use the NCSTG command, you can write an NCSTG program to fetch CSTG in the application library.

Because SYSCST is available in a steplib, this method can regulate access to the Administration subsystem. As the Natural Construct administrator, you can use the security routines in the SYSCSTX library to control access to this subsystem.

The following example describes how to use the steplib method to eliminate direct command processing in Natural Construct-generated programs. Direct command processing is triggered by the #PDAX-DIRECT-COMMAND-PROCESS variable on the CU—MA0 map. You can remove the field that contains this variable from the CU—MA0 map and move the modified map into a steplib at a higher level than the SYSCST library.

➢ To use steplibs, assuming that APPL is the application library:

1. Define the steplibs to APPL in the following order: NODIRECT, SYSCST, and SYSTEM from Natural Security. NODIRECT is a new library and SYSCST and SYSTEM are steplibs of this new library.
2. Copy the CU—MA0 map from the SYSCST library to the NODIRECT library.
3. Edit the CU—MA0 map in the NODIRECT library.
   Delete the text “Mark to include Direct Command Processing” and define the field containing the #PDAX-DIRECT-COMMAND-PROCESS variable as non-display.
4. Stow the modified CU—MA0 map.

5 If you deleted the field that contains the #PDAX-DIRECT-COMMAND-PROCESS variable, copy all the modules that use the CU—MA0 map in the SYSCST library to the NODIRECT library and catalog them. Because SYSCST and SYSTEM are steplibs of NODIRECT, these modules can be cataloged in the NODIRECT library.

Note: If you use the steplib version of Natural Construct for batch regeneration, use the CSTBGEN command instead of the NCSTBGEN command.

Invoking Natural Construct From a Steplib

To invoke Natural Construct from a steplib, define the SYSCST and SYSLIBS libraries as steplibs of all development libraries requiring Natural Construct. You should also define a higher level steplib where modules can be stored that override the supplied objects. This steplib should also contain a module called NCSTG, which is coded as follows:

```
FETCH 'CSTG'
END
```

If extensive code frame changes are required, consider installing a second copy of the Natural Construct system file. You can then make changes to code frames directly, without having to make a copy of individual frames and/or modules. You can use the compare facilities supplied with Natural Construct to compare modified models and code frames with the originals.

For more information about the compare facilities, see **Compare Menu Function**, page 66.

EXTERNAL OBJECTS

This chapter describes the programs, subprograms, and helproutines that help simplify and standardize the model creation process. These utilities can be invoked by the supplied models or by user-written models.

Note: The source code for external objects is not supplied.

The following topics are covered:

Introduction

All model subprograms use external parameter data areas (PDAs) stored in the SYSCST library. The source for the PDAs is provided and contains details about each parameter. For example, some of the listings for the CPAEL PDA are:

```
Parameter CPAEL     Library SAG                              DBID  18 FNR   4
Command                                                                    > +
I T L Name                            F Leng Index/Init/EM/Name/Comment
Top - ------------------------------- - ---- --------------------------------
    1 CPAEL
    2 INPUTS
    3 FILE-NAME                       A   32 /* File Name.
    3 FIELD-NAME                      A   32 /* Field name to be found in the
    3 #SIMPLE-OUTPUTS-ONLY            L      /* True if interested in
  *                                          /* #FIELD-FOUND only
  *                                          /* given file
    2 INPUT-OUTPUTS
    3 FILE-CODE                       P    8 /* If this code is known,
  *                                          /* NSC checks are avoided.
    3 DDM-PREFIX                      A   16 /* Field prefix on DDM,
  *                                          /* this will be set if correct
  *                                          /* FILE-CODE is not provided.
    2 SIMPLE-OUTPUTS
    3 #FIELD-FOUND                    L      /* True if field found on file
    3 FIELD-IS-REDEFINED              L      /* The field is redefined.
------------------------------------------------------------------ S 70  L 1
```

CPAEL PDA

CPAEL contains a level 1 structure called CPAEL. Depending on the type of parameter, the remaining parameters are grouped into the following structures: INPUTS, INPUT-OUTPUTS, and OUTPUTS. This layout is the same for all PDAs used by the supplied subprograms.

Note: Be careful when modifying fields in the INPUT-OUTPUTS structure; these fields may retain information across multiple calls.

You can define the PDAs as local data areas (LDAs) within the model subprograms that invoke the utilities. CPAEL is the PDA corresponding to the CPUEL subprogram utility, which returns information about a field in Predict.

Example of a model subprogram requiring field information from Predict

```
DEFINE DATA PARAMETER
 PARAMETER
  .
  .
  .
LOCAL USING CPAEL
LOCAL USING CSASTD
  .
  .
  .
END-DEFINE
  .
  .
  .
ASSIGN CPAEL.FILE-NAME = #PDAX-FILE-NAME
ASSIGN CPAEL.FIELD-NAME = #PDAX-FIELD-NAME
CALLNAT 'CPUEL' CPAEL CSASTD
*
*Check outputs of CPUEL
  .
  .
  .
END
```

This chapter provides a brief description of the supplied program, subprogram, and helproutine utilities. For examples of how to invoke the utilities, see the source code for the supplied model subprograms in the SYSCST library (prefixed by CU).

Driver programs for many of the supplied model programs and subprograms are included on the Natural Construct tape (prefixed by CTE). These driver programs are also available through the Drivers menu option on the Administration main menu. If a driver program is available, its location is listed under Driver Menu Option for the program or subprogram.

For information about invoking the driver programs, see **Drivers Menu Function**, page 79.

Object Categories

The supplied objects are divided into three categories, based on the type of information they access. Each category is identified by its prefix as follows:

Prefix	Object Category
CN*	Identifies objects that return or generate data based on information in the Natural system files.
CP*	Identifies objects that return or generate data based on information in Predict.
CS*	Identifies objects that are miscellaneous validation, calculation, or translation routines. Most of these routines do not access system file information, but some access Natural Construct system files.

Whenever possible, use the supplied programs, subprograms, and helproutines instead of accessing the system file information directly. This helps protect your programs from unwanted changes to the internal structure. Natural Construct maintains the upward compatibility of the supplied programs, subprograms, and helproutines.

Processing Errors

Many of the supplied subprograms return information through the CSASTD parameter data area (PDA). You should check the value in the RETURN-CODE field after each call. If it is not blank, it should be passed back to the generation nucleus so the user is aware of the problem.

Example of a model subprogram that invokes the CPUEL utility

```
DEFINE DATA
 PARAMETER USING CUMYPDA
 PARAMETER USING CU--PDA
 PARAMETER USING CSASTD
 LOCAL USING CPAEL
  .
  .
  .
END-DEFINE
  .
  .
  .
CALLNAT 'CPUEL' CPAEL CSASTD
IF CSASTD.RETURN-CODE NE ' ' THEN
   ESCAPE ROUTINE IMMEDIATE
END-IF
```

Passing Structure Names

To invoke the supplied subprograms, pass only the level 1 structures in the PDA. This way, if new parameters are added to the utilities in future versions of Natural Construct, you only have to recatalog your model subprograms to incorporate the changes.

Restricted Data Areas

Some subprograms have restricted data areas to retain information across multiple calls. The restricted data areas are identified by an R in the third position of the data area name (CP**R**ELNX, for example).

You do not need to be concerned with the contents of these data areas. Define them as local data areas within the invoking subprograms and pass them to the subprogram that is invoked.

Note: As with all PDAs, the name of the structure passed to the subprogram always matches the name of the data area itself.

Callback Functions

Many of the Construct utility subprograms iterate through system data and for each record found call a user-supplied routine. For example, CPURLRD is used to retrieve all relationships related to a particular file. Rather than returning these relationships to the caller of CPURLRD, the caller must supply the name of a subprogram that CPURLRD should call for each relationship found.

These routines accept an A1 array to allow the caller of the utility to communicate information to and from the subprogram called by the Construct utility. This data area is represented by CSAPASS. It is accepted by the utility as a 1:v array so that the actual size of the data area can be determined by the requirements of the caller.

Subprogram Chaining

When a subprogram performs read logical processing and returns a series of records, it is sometimes difficult or inefficient for the subprogram to "remember" where it left off in a previous call. Also, this type of processing can be awkward to code in the invoking object because it must define looping logic and issue iterative CALLNATs until a certain end condition is reached.

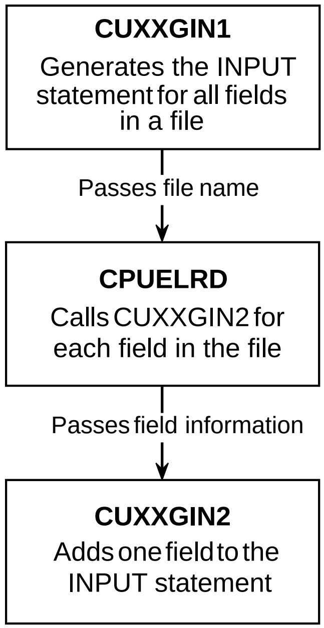
To avoid these problems, some subprograms do not return the information to the calling object. Instead, the calling object passes the name of a subprogram that is invoked for each record encountered. To generate an INPUT statement containing all fields in a file, for example, you can use the CPUELNX and CPUELRD subprograms. These subprograms are described in the following sections.

No Subprogram Chaining (CPUELNX)

The CPUELNX subprogram can be called iteratively to continually return the next field in the file until an end-of-file condition is reached. The model subprogram that generates the INPUT statement must define the looping logic and make iterative CALLNATs to include each field in the INPUT statement.

Using Subprogram Chaining (CPUELRD)

The CPUELRD subprogram can be invoked once by your model subprogram (CUXXGIN1, for example). This subprogram receives the name of a file and the name of a subprogram to CALLNAT (CUXXGIN2, for example). It traverses through the specified file and CALLNATs the subprogram for each field. That subprogram adds the current field to the INPUT statement generated. For example:



Example of Subprogram Chaining

To allow CPUELRD to remember information across iterative calls, a 1K area is passed to CUXXGIN2. This area can be redefined into individual fields, such as current status information, that are required by CUXXGIN2 across multiple calls. It can also pass additional information between CUXXGIN1 and CUXXGIN2.

Note: For an example of how subprogram chaining is used, see the CUFMGIN1 and CUFMGIN2 programs in the SYSCST library.

Natural-Related Subprograms (CNU*)

The subprograms described in the following sections retrieve information from the Natural system files to assist in the generation process. For subprograms that return information about Natural objects (programs, data areas, etc.), the specified data area object must exist in the current library or one of its steplibs.

Driver programs for many of the supplied programs and subprograms are available through the Driver Menu option on the Administration main menu. If a driver program is available, its location is listed in the **Driver Menu Option** section for the program or subprogram.

For information about invoking the driver programs, see **Drivers Menu Function**, page 79.

CNUEL Subprogram

CNUEL	Description
What it does	Retrieves information about a field in a local data area (LDA) or parameter data area (PDA). This subprogram receives the name of a field and data area (CNAEL.INPUTS) and returns information about the field (CNAEL.OUTPUTS), such as the structure to which the field belongs, the field format and type, the level number, and the starting and ending index for arrays.
PDAs used	CNAEL CSASTD
Files accessed	SYSTEM-FUSER SYSTEM-FNAT

Driver Menu Option

```
 CTEELN           ***** Natural Related Subprograms *****        CTEELN1
 Oct 09                - Driver for subprogram CNUEL -           12:52 PM

*Data Area Name : ________
 Field Name.....: ________________________________
 Structure Name : ________________________________

 View Of Name...:

 Field Found....:     Field Format:        Lvl Number....:
 Constant Field :     Field Length:        Lvl Type Trail:
 Field Redefined:     Rank........:

 From Index  Thru Index  1:V   Field Occurrences
 ----------  ----------  ---   -----------------



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CNUEL Window
Natural Submenu, Data Areas Submenu, Field Information Option

CNUELNX Subprogram

CNUELNX	Description
What it does	Returns information about the next field in a data area. This subprogram receives the name of an external data area and returns information about the next field in that data area. On the first call to this subprogram, the field in the data area is returned. On subsequent calls, the next fields are returned. The CNRELNX PDA (containing reserved variables) keeps track of the current position of the data area and must *not* be modified by the calling program. (For more information about the INPUT/OUTPUT parameters, see the CNAELNX PDA in the SYSCST library.)
PDAs used	CNAELNX CNRELNX CSASTD
File accessed	SYSTEM-FNAT

Driver Menu Option

```
 CTENLNX          ***** Natural Related subprograms *****        CTENLNX1
 Oct 09              - Driver for subprogram CNUELNX -          12:55 PM

*Data Area Name..: ________       Field Count:       Constant Field :
 First Time......: X             End Of File:       Field Redefined:

 Structure Name..:                                  Field Format...:
 Field Name......:                                  Field Length...:
 View Of Name....:                                   Units..........:
 Level Number....:                                  Decimals.......:
 Level Type Trail:                                  Rank...........:

 From Index  Thru index  1:V      Field Occurrences
 ----------  ----------  ---      -----------------




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CNUELNX Window
Natural Submenu, Data Areas Submenu, Get Next Field Information Option

CNUERMSG Subprogram

CNUERMSG	Description
What it does	Receives a Natural error message number and returns the error message text. This subprogram receives a Natural error message number (CSASTD.MSG-NR) and returns the corresponding error message text (CSASTD.MSG). For example, the message text for Natural message number 0888 is “Storage Overflow During Compilation or Execution”.
PDA used	CSASTD
File accessed	SYSTEM-FNAT

Note: This subprogram returns system error messages rather than application error messages. For information about application error messages, see **CNUMSG Subprogram**, page 366.

Driver Menu Option

```
 CTEERMSG           N a t u r a l  C o n s t r u c t          CTERMSG1
 Aug 14              Driver for subprogram CNUERMSG             1 of 1


  Msg Nr...: ____   Error Fld:
  Ret Code :

  Msg:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUERMSG Window
Natural Submenu, Retrieve System Error Msg Option

CNUEXIST Subprogram

CNUEXIST	Description
What it does	Checks for the existence of a Natural module. This subprogram receives a Natural module name and determines whether its source, compiled object, or both exist. If the source and/or compiled object exist, this subprogram returns the module type (P, for program) and the library name(s) where the source and/or compiled object(s) were found. If the module is not found in the current library, you can request a search of all steplibs. In this case, the name of the first library where the module was found is returned.
PDAs used	CNAEXIST CSASTD
Files accessed	SYSTEM-FUSER SYSTEM-FNAT

Driver Menu Option

```
 CTEEXIST          ***** Natural Related Subprograms *****         CTEXIST
 Oct 09              - Driver for subprogram CNUEXIST -           01:14 P

*Object/Source Name......: ________    Source            Object
 Library Name............: CST341__    -----------------  -----------------
                                       Exists.:           Exists.:
 Multi Steplib Search....: _           Type...:           Type...:
    Default DBID/FNR Only: _            Library:           Library:
                                       DBID...:           DBID...:
 Object/Source or Both...: _           FNR....:           FNR....:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUEXIST Window
Natural Submenu, Verify Source/Object Existence Option

CNUGDABL Subprogram

CNUGDABL	Description
What it does	Builds a full path name for a global data area (GDA) block. This subprogram receives a GDA name and the name of a GDA block. It returns the full path name from the master block to the specified block. For example, if BLOCK11 is a sub-block of BLOCK1, which is a sub-block of MASTER-BLOCK, the following full path name is returned: `MASTER-BLOCK.BLOCK1.BLOCK11`
PDAs used	CNAGDABL CSASTD
Files accessed	SYSTEM-FUSER SYSTEM-FNAT

Driver Menu Option

```
 CTEGDABL             N a t u r a l  C o n s t r u c t            CTEGDAB1
 Aug 14                Driver for subprogram CNUGDABL               1 of 1

*GDA Name......: ________
 Block Name....: ________________________________

 Full Path Name:


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                  mai
```

Driver for Subprogram CNUGDABL Window
Natural Submenu, Build Path Name for GDA Block Option

CNUGDAEL Subprogram

CNUGDAEL	Description
What it does	Verifies that a field is contained in a global data area (GDA). This subprogram receives the name of a GDA and the name of a field. If the field exists in the GDA, this subprogram returns a confirmation flag.
PDAs used	CNAGDAEL
Files accessed	SYSTEM-FNAT SYSTEM-FUSER

Driver Menu Option

```
 CTEGDAEL            N a t u r a l  C o n s t r u c t            CTEGDAE1
 Aug 14               Driver for subprogram CNUGDAEL               1 of 1

 *GDA Name...: ________
  Field Name : ________________________________
  Field Found:



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUGDAEL Window
Natural Submenu, Verify GDA Field Existence Option

CNUGENDA Subprogram

CNUGENDA	Description
What it does	Adds a field to a data area. This subprogram receives the definition of a field (field type, level number, field name, field format and length, and the number of occurrences, for example) to be added to a data area and generates the field definition at the end of the current edit buffer. For more information about the INPUT/OUTPUT parameters, see the CNAGENDA data area in the SYSCST library
Note:	Before this subprogram is invoked, the calling program must set the Natural editor to a data area type of A, L, or G.
PDAs used	CNAGENDA CNRGENDA CSASTD
Files accessed	None

Driver Menu Option

```
 CTEGENDA           N a t u r a l  C o n s t r u c t          CTEGEND1
 Aug 14              Driver for subprogram CNUGENDA              1 of 1

Field Name: ________________________________

Field Type: _ Format: _     Occurrences: ____
Level.....: _ Length: _____ Comment....: _________________________________


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUGENDA Window
Natural Submenu, Data Areas Submenu, Add a Field to a Data Area Option

CNUMPPRF Subprogram

CNUMPPRF	Description
What it does	Reads a map profile from a Natural system file. This subprogram receives the name of the map profile in the CSAMPSET.#PROFILE field. It reads the specified map profile from the Natural system file (FNAT) and returns the map settings. For information about the OUTPUT parameters, see the CSAMPSET data area in the SYSCST library.
PDAs used	CSAMPSET CSASTD
File accessed	SYSTEM-FNAT

Note: This routine is not available on all platforms.

Driver Menu Option

```
 CTEMPPRF          N a t u r a l  C o n s t r u c t          CTEMPRF1
 Aug 14             Driver for subprogram CNUMPPRF              1 of 1

Map Profile....: ________     Layout......:             Map Type.....:
Map Version....:              Map Name....:             Std  Keys....:

        +--------------------------------------------+
    1__ | Delimiter Class   AD   CD   Delimiter Char |
DC:     | ---------------   --   --   -------------- |   Col Shift....:
PS:     |                                            |   Case Deflt...:
LS:     |                                            |   Cursor Skip..:
ZP:     |                                            |   PM...........:
        +--------------------------------------------+

Write Statement:              CV..........:             Justification:
Input Statement:              Error Code..:             Enforce Attr :
Auto Rule Rank :              Hlp Fld Dflt:
Fill Character :              Help........:
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                  mai
```

Driver for Subprogram CNUMPPRF Window
Natural Submenu, Map Settings Information Option

CNUMSG Subprogram

CNUMSG	Description
What it does	Returns application message text from the SYSERR message file. This subprogram receives the following input: • message number • message library (CSTMSG by default) • message text • substitution data members • message libraries for data members (CSTLDA by default) • retrieval method • default languages (used if message number is not located using *Language) It processes message text based on one of the following retrieval methods:
R	Performs text retrieval based on message numbers. A message number can be entered in either the Message Number field or the Message Text (Input) field. If a message number is entered in the Message Number field, the corresponding text is retrieved from the message library (CSTMSG by default) and displayed at runtime. If the Message Number field is blank, the subprogram scans the Message Text (Input) field for a message number. If one is located, it is replaced with its corresponding text from the message library. For example, suppose message number "*2309" corresponds to the message text ":1::2::3:does not exist". If this message number is located in either the Message Number or Message Text (Input) fields, the subsystem will retrieve the message text ":1::2::3:does not exist".

CNUMSG		Description (continued)
	S	Performs text substitutions in the Message Text (Input) field. A substitution will occur if typing placeholders are found in the message text. Placeholders are replaced at runtime with a value entered in one of the Message Substitution Data fields (1, 2, and 3). Placeholders are entered in the following format: ":N:", where "N" identifies one of the three Message Substitution Data fields. For example, suppose you enter the following message text: ":1::2::3:does not exist", and the Message Substitution Data field 1 is "File", and the Message Substitution Data field 2 is "NCST-CUSTOMER". The returned message text would be "File NCST-CUSTOMER does not exist". For more information about message numbers and placeholders, see **Using SYSERR References**, page 496**.**
	B	Performs text retrieval using methods R and S which are explained earlier in this section. This method also supports inline retrieval and substitution; that is, typing the message number and substitution values directly in the Message Text (Input) field. For example, suppose you type the following entry in the Message Text (Input) field: "*2309,*2075.1,NCST-CUSTOMER". The subprogram assigns 2309 as the message number and retrieves the message, ":1::2::3:does not exist". The first substitution value is retrieved from message 2075.1, which is "File". The second substitution value is the text "NCST-CUSTOMER". At runtime, "File NCST-CUSTOMER does not exist" is displayed.

CNUMSG	Description (continued)
	If you are using message numbers, you can specify up to eight default languages. If the message text for the message number is not found using the currently selected language (*Language), the subprogram will search for the message in each of the specified default languages. The search begins with the *Language code specified in the first Default Language field through to the last Default Language field in which a code is specified. If the message is still not located, the subprogram will search the message text for the default system *Language code of 1 (English).
Note:	You can center text entered in the Message Text (Input) field using the ",+/NN" notation, where NN is the number of characters to be centered. For more information, see **Using SYSERR References**, page 496**.**
PDA used	CNAMSG CSASTD
File accessed	SYSTEM-FUSER

Driver Menu Option

```
CTEMSG           ***** Natural Related subprograms *****        CTEMSG1
Oct 16              - Driver for subprogram CNUMSG -            08:53 AM

Message Number.: 0008  *Message Library: CSTMSG__
Message Text (Input)
  ___________________________________________________________________________

Retrieval Method: R ('R' for Retrieve, 'S' for Substitute, 'B' for Both)

Message Substitution
  Data(1): _________________________________  *Message Library: CSTLDA__
  Data(2): _________________________________  *Message Library: CSTLDA__
  Data(3): _________________________________  *Message Library: CSTLDA__

Default Languages
  *LANGUAGE: 1  1) 1_ 2) 1_ 3) 1_ 4) 1_ 5) 1_ 6) 1_ 7) 1_ 8) 1_

Response Code: 0     ( 9 - unsuccessful )

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUMSG Window
Natural Submenu, Retrieve Application Error Message
Retrieve Single Message Option

CNUPEXST Subprogram

CNUPEXST	Description
What it does	Checks for the existence of a map profile. This subprogram receives the name of a map profile and verifies that it exists in the Natural FNAT system file.
PDA used	CNAPEXST
File accessed	SYSTEM-FNAT

Note: This module is not available on all platforms.

Driver Menu Option

```
CTEPEXST             N a t u r a l   C o n s t r u c t            CTEPXST1
Aug 14                Driver for subprogram CNUPEXST                1 of 1

 Map Profile Name..: ________
 Map Profile Exists:




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUPEXST Window
Natural Submenu, Verify Map Profile Existence Option

CNUSEL Subprogram

CNUSEL	Description
What it does	Selects fields from data areas (local or parameter). This subprogram receives the name of a local (LDA) or parameter data area (PDA) and browses fields in the data area. To select a field, mark it. If more than one field is marked, only the first field is selected. You can enter X to terminate the display or T to position the list to the top.
PDAs used	CNASEL CSASTD
Files accessed	None

Driver Menu Option

```
 CTESEL          ***** Construct Related Subprograms *****        CTESEL1
 Oct 09,96          - Driver for subprogram CNUSEL -              01:52 PM

 *Data Area Name..: ________  Fld Name:

                                                  Field Occurrences
  Structure Number:           Field Format:       -----------------
  Type Of Field...:          Field Length:
  Level Number....:           Units.......:
  Total Fields Cnt: 0         Decimals....:







Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CNUSEL Window

CNUSRCNX Subprogram

CNUSRCNX	Description
What it does	Receives the name of the Natural object and returns the next source line. The first call to the subprogram returns the first source line. Subsequent calls return the next lines.
PDAs used	CNASRCNX CNRSRCNX CSASTD
Note:	The CNRSRCNX data area (containing reserved variables) keeps track of the current position of the object source and must not be modified by the calling program.
Files accessed	SYSTEM-FUSER SYSTEM-FNAT

Driver Menu Option

```
CTESRCNX            N a t u r a l   C o n s t r u c t            CTESRCN1
Aug 14               Driver for subprogram CNUSRCNX                1 of 1

*Object Name: CTELRDSM                    Version:
 First Time : X                           Include Comments: _

 Src Line...:       Userid:               Date...:     -  -        Type:
 End Of Src :       Level :               Time...:   .  .  .       SM..:

 Src Code...:



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUSRCNX Window
Natural Submenu, Get Next Source Line Option

CNUSRCRD Subprogram

CNUSRCRD	Description
What it does	Reads source text and performs specified processing. This subprogram receives the name of a Natural object (in the CNASRCRD.#OBJECT-NAME field) and the name of the subprogram invoked to process each source line (in the CNASRCRD.#CALLNAT field). It passes the fields it receives to the subprogram it invokes. CU---DA, which contains the model parameters, is also passed to CNUSRCRD, as well as the CSAPASS PDA. CSAPASS can be redefined as required. It "remembers" information between calls to the subprogram that processes each source line.
PDAs used	CNASRCRD CU--PDA (model PDA) CSAPASS (redefined as required) CSASTD
Files accessed	SYSTEM-FUSER SYSTEM-FNAT

Driver Menu Option

```
CTESRCRD            N a t u r a l   C o n s t r u c t            CTESRCR1
Aug 14               Driver for subprogram CNUSRCRD               1 of 1

*Object Name: ________          Finished:
*CALLNAT....: CTESRCSM          Include Comments: _

 Object Information
 ------------------
 Type.......:     Version:       Userid:            Time:   .  .  .
 SM.........:     Level..:                          Date:     -  -

 Src Line...:
 Source Code:
            :




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CNUSRCRD Window
Natural Submenu, CALLNAT For Each Source Line Option

Natural-Related Helproutines (CNH*)

You can attach the following helproutines to fields that require the input of Natural information (such as object names, message numbers, etc.). They are active helproutines that populate the field to which they are attached.

CNHMDL Helproutine

CNHMDL	Description
What it does	Browses all the Natural Construct models for selection. Valid restriction parameters are: • S (display statement models only) • M (display program models only) • B (display all models)
Attached to	Input of a Natural Construct model name.
Parameter used	#PDA-RESTRICTION(A1) #PDA-KEY(A32) (model name)
File accessed	NCST-MODEL

CNHMSG Helproutine

CNHMSG	Description
What it does	Browses for and displays the application error message text. You can add new messages to the application by pressing the Add PF-key (the new message number is always adjusted to the next available number).
Attached to	Input of a message number field.
Parameters used	#PDA-MESSAGE(A65) #PDA-MESSAGE-LIBRARY(A8) #PDA-KEY(N4)
File accessed	SYSTEM-FUSER

CNHOBJ Helproutine

CNHOBJ	Description
What it does	Browses all objects of a specified type in the current library. This helproutine receives an object type and browses all the objects with that type that exist in the current library. Valid object types are: • P (program) • N (subprogram) • S (subroutine) • M (map) • H (helproutine) • C (copycode) • A (parameter) • G (global) • L (local) • T (text) • * (all) • 2 (subprogram/helproutine) • 3 (subprogram/helproutine/subroutine) • 4 (program/subprogram/helproutine/subroutine) • 5 (command processor) • D (data area)
Attached to	Input of a Natural object name field.
Parameters used	#PDA-TYPE(A1) #PDA-KEY(A8)/* Start/Return key
File accessed	SYSTEM-FUSER

Natural Construct Generation Utility Subprograms (CSU*)

The following subprograms perform specialized functions to assist in the generation process.

Note: Drivers for many of the supplied programs/subprograms are available through the Drivers menu option on the Administration main menu. If a driver program is available, its location is listed under the Drivers option in the program/subprogram's description. For more information about the supplied driver programs, see **Drivers Menu Function**, page 79.

CSU-VAR Subprogram

CSU-VAR	Description
What it does	Validates a specified variable name. This subprogram receives a string and checks for a valid Natural naming convention. Use it whenever a name used as a Natural variable is input. If the name is invalid, the subprogram returns a message containing the reason.
Note:	The name can be fully qualified (contain a prefix).
Parameters used	#PDA-STRING(A65)/*INPUT CSASTD
Files accessed	None

Driver Menu Option

```
 CTE-VAR          ***** Construct Related Subprograms *****        CTE-VAR1
 Oct 09                - Driver for subprogram CSU-VAR -            02:58 PM

String: _________________________________________________________________

Msg...:


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSU-VAR Window
Other Submenu, Validation Subroutines Submenu
Validate a Variable Name Option

CSUBANN Subprogram

CSUBANN	Description
What it does	Generates the standard banner into the source buffer. Use this subprogram to generate Natural or Visual Basic comments.
Parameters used	CSABANN CSASTD
Files accessed	None

CSUBLDRP Subprogram

CSUBLDRP	Description

What it does	Builds a report layout. This subprogram builds a report layout for the Batch, Browse, and Browse-Select models. It can be invoked from a sample subprogram within a user exit. The invoking subprogram must issue an initial RESET statement to clear the structures in CSASELFV. For example:
	`RESET CSASELFV`
	`CSASELFV.GENERAL-INFORMATION`
	`CSASELFV.FIELD-SPECIFICATION(*)`
	The sample subprogram must also contain a SET KEY ALL statement.
	For an example of how to invoke the CSUBLDRP utility, see the CUSCSRP subprogram in the SYSCST library.

PDAs used	CSABLDRP CSASELFV CSASTD
Files accessed	None

CSUBMIT Subprogram (Mainframe)

CSUBMIT	Description
What it does	Submits a job for execution. The JCL for the job must be in the source buffer. This subprogram is used in conjunction with the CSUSUB command. For more information, see the **JCL Submit Utility (Mainframe)**, page 905 in *Natural Construct Generation User's Manual*.
PDAs used	CSASTD
Files accessed	None

CSUBYTES Subprogram

CSUBYTES	Description
What it does	Calculates the required bytes for a field, based on the field's Natural format and length. This subprogram receives the length and format of a field and returns the number of bytes occupied by the field.
PDAs used	CSABYTES CSASTD
Files accessed	None

Driver Menu Option

```
 CTEBYTES            N a t u r a l  C o n s t r u c t            CTEBYTE1
 Aug 14               Driver for subprogram CSUBYTES               1 of 1

Field Format: _        Bytes.......:
Field Length: _____
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUBYTES Window
Other Submenu, General Utility Subprograms Submenu
Storage Required for a Variable Option

CSUCASE Subprogram

CSUCASE	Description
What it does	Converts a string to upper/lower/mixed case. This subprogram receives a string and a desired function. It converts and returns the string as follows: • If the function is U, this subprogram converts all alpha characters in the string to upper case. • If the function is L, it converts all alpha characters to lower case. • If the function is M, it converts the alpha characters as follows: – removes leading hash (#) or plus (+) characters – replaces all dashes (-) and underscores (_) with blanks – converts the first character, as well as all characters following a dash or underscore, to upper case
PDAs used	CSACASE CSASTD
Files accessed	None

Driver Menu Option

```
 CTECASE              N a t u r a l  C o n s t r u c t           CTECASE1
 Aug 14                Driver for subprogram CSUCASE                1 of 1

Function: _    U=Upper, L=Lower, M=Mixed Case
String..: _____________________________________________________________
          ___________________________________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUCASE Window
Other Submenu, General Utility Subprograms Submenu
Convert Text to Upper/Lower/Mix Option

CSUCCMD Subprogram

CSUCCMD	Description
What it does	Generates command block delimiters into the Natural source buffer for models that generate multiple modules. This subprogram receives a command type, an eight character module name, a module type, and, optionally, the name of a model. Natural Construct evaluates the contents of these command blocks after it processes the pre-generation subprogram for the multi-generation model. Before continuing the generation process, Natural Construct either creates the child model specification or saves, stows, and catalogs the contents of the command block. CSUCCMD must always be called twice — first to initialize the command block and then to close it after generating the contents of the command block.
Note:	See the CSLCCMD local data area for valid command values.
Note:	You cannot use nested command blocks.
Parameters used	CSACCMD CSASTD
Files accessed	None

CSUCENTR Subprogram

CSUCENTR	Description
What it does	Centers a text string. This subprogram centers text, such as headings, in a variable. The length passed to this subprogram should be either: • the length of the variable that stores the heading or • the length of the AL parameter that displays the variable that stores the heading
PDAs used	CSACENTR CSASTD
Files accessed	None

Driver Menu Option

```
 CTECENTR            N a t u r a l   C o n s t r u c t            CTECNTR1
 Aug 14               Driver for subprogram CSUCENTR                1 of 1

Length: ___

String: ________________________________________________________________
        ___________________________________

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUCENTR Window
Other Submenu, Text Related Subprograms Submenu
Center a Text String Option

CSUCOMPR Subprogram

CSUCOMPR	Description
What it does	Generates an IF clause for two structures. The subprogram receives two structure names and a list of underlying components to compare. It generates the IF clause according to the criteria requested (LT, LE, GT, GE).
Note:	DB2 users should use the CSUDB2SP subprogram to compare key values (see the following section for a description of this subprogram).
PDAs used	CSACOMPR CSASTD
Files accessed	None

Driver Menu Option

```
 CTECOMPR            N a t u r a l   C o n s t r u c t            CTECOMP1
 Aug 14               Driver for subprogram CSUCOMPR                1 of 1

Comparison Operator.: __    Lhs Structure: ________________________________
Tab.................: ___   Rhs Structure: ________________________________
No. Of Components...: ___
                                Component Fld Name
                   +----------------------------------+
               1__ | ________________________________ |
                   | ________________________________ |
                   | ________________________________ |
                   | ________________________________ |
                   | ________________________________ |
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                 mai
```

Driver for Subprogram CSUCOMPR Window
Other Submenu, DB2 Related Subprograms Submenu
Generate an IF for a Superde Option

CSUCTRL Subprogram

CSUCTRL	Description
What it does	Retrieves information from the Natural Construct Control record and sets the PF-keys, help indicator, underscore characters, position indicators, disable indicator, scroll indicator, "of" right prompt, and dynamic attributes for Natural Construct.
Parameters used	CU--PDA CSASTD
Files accessed	NCST-CONTROL

CSUCURS Subprogram

CSUCURS	Description
What it does	Determines the position of the field in which the cursor is placed. This subprogram is invoked when runtime translation is requested. It determines the message numbers and positions associated with fields in a translation LDA and invokes the CSUTLATE subprogram to perform runtime translation.
Parameters used	#TRANSLATION-DATA(A1/1:V) #SYSERR-APPL(A8) #DATA-AREA-NAME(A8) #TEXT-REQUIRED(L) #LENGTH-OVERRIDE(I4) CSACURS CSASTD
Files accessed	None

CSUCURS1 Subprogram

CSUCURS1	Description
What it does	Determines the position of a single field in which the cursor is placed. This subprogram is invoked whenever runtime translation of a single field is requested. It determines the message number and position associated with that field and invokes the CSUTLATE subprogram to perform runtime translation.
Parameters used	#TRANSLATION-DATA(A1/1:V) #SYSERR-APPL(A8) CSASTD
Files accessed	None

CSUDB2SP Subprogram

CSUDB2SP	Description

What it does	Generates a FIND statement for a superdescriptor. This statement retrieves DB2 records based on a complex key definition. If a complex key is composed of 5 fields (Field1, Field2, Field3, Field4, and Field5), for example, the generated FIND/WHERE clause is:
	`Field1 GE #INPUT.Field1`
	`SORTED BYField1`
	`Field2`
	`Field3`
	`Field4`
	`Field5`
	`WHERE Field2 GE #INPUT.Field2`
	`AND Field3 GE #INPUT.Field3`
	`AND Field4 GE #INPUT.Field4`
	`AND Field5 GE #INPUT.Field5`
	`OR Field1 GE #INPUT.Field1`
	`AND Field2 GE #INPUT.Field2`
	`AND Field3 GE #INPUT.Field3`
	`AND Field4 GT #INPUT.Field4`
	`OR Field1 GE #INPUT.Field1`
	`AND Field2 GE #INPUT.Field2`
	`AND Field3 GT #INPUT.Field3`
	`OR Field1 GE #INPUT.Field1`
	`AND Field2 GT #INPUT.Field2`
	`OR Field1 GT #INPUT.Field1`
	Note: #INPUT is the qualifier for the RHS fields of the inequations.

PDAs used	CSADB2SP CU--PDA CSASTD
Files accessed	None

Driver Menu Option

```
 CTEDB2SP           N a t u r a l  C o n s t r u c t           CTEDB2S1
 Aug 14              Driver for subprogram CSUDB2SP              1 of 1

*File Name.........: ________________________________  Find Next Record: _
*Field Name........: ________________________________
 Function..........: ________________________________

 LHS Structure.....: ________________________________
 LHS Index.........: _______________
 RHS Structure.....: ________________________________
 RHS Index.........: ________________________________

 Prefix Length.....: ___
 Low Key Structure : ________________________________
 High Key Structure: ________________________________

 Tab...............:
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUDB2SP Window
Other Submenu, DB2 Related Subprograms Submenu
Generate a FIND for a Superde Option

CSUDELFF Subprogram

CSUDELFF	Description
What it does	Deletes the lines containing */ in the edit buffer. This subprogram searches for and deletes the lines containing */ in the edit buffer. These lines are written by WRITE/PRINT statements when the DEFINE PRINTER OUTPUT 'SOURCE' statement is used.
PDAs used	None
Files accessed	None

Driver Menu Option

```
    CTEDELFF              N a t u r a l   C o n s t r u c t            CTEMAP1
    Aug 14                 Driver for subprogram CSUDELFF               1 of 1

                      +------------------------------------+
                      |                                    |
                      |       PRESS ENTER TO EXECUTE.      |
                      |                                    |
                      +------------------------------------+

                           Read in New Source: _
                          *New Source Name...: ________
                           New Source Library: DEVPR___

   Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
         help  retrn quit                                                 mai
```

Driver for Subprogram CSUDELFF Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Delete Lines Containing */ Option

CSUDEFLT Subprogram

CSUDEFLT	Description
What it does	Provides defaults used by the Natural Construct models. This subprogram provides an interface between generated applications and the user-maintained CSXDEFLT subprogram. To override default settings, modify CSXDEFLT. The CCDEFLTA, CCDEFLTL, and CCDEFLTN copycode members return defaults for alphanumeric, logical, and numeric values, respectively.
Parameters used	CSADEFLT CSASTD
Files accessed	None

CSUDYNAT Subprogram

CSUDYNAT	Description

What it does	Builds parameters containing dynamic attributes. This subprogram receives a set of dynamic attribute characters in the CSADYNA.#ATTRIBUTE-CHARS(A11/1:13) field and builds the definition for the DY= parameter. The positioning within this array indicates the type of dynamic attribute assigned. The positions and attributes are:
	• 1 (normal intensity)
	• 2 (intensified)
	• 3 (blinking)
	• 4 (cursive/italic)
	• 5 (underlined)
	• 6 (reversed video)
	• 7 (blue)
	• 8 (green)
	• 9 (neutral/white)
	• 10 (pink)
	• 11 (red)
	• 12 (turquoise)
	• 13 (yellow)
	
	For example, if you input:
	`#ATTRIBUTE-CHARS(1) = '}'`
	`#ATTRIBUTE-CHARS(2) = '{'`
	This subprogram returns:
	`#DY-PARAMETER = DY={I`
	If the caller's attributes are printable special characters, they are represented literally. Otherwise, they are represented using the HH syntax. Note that programs containing those represented in hex may not be portable.

Note: The dynamic attribute character specified in position 1, which corresponds to normal intensity, is always coded at the end of the DY= parameter.

CSUDYNAT	Description (continued)
PDAs used	CSADYNAT CSASTD
Files accessed	None

Driver Menu Option

```
 CTEDYNAT            N a t u r a l   C o n s t r u c t           CTEDYNT1
 Aug 14               Driver for subprogram CSUDYNAT              1 of 1

                              Attribute Characters
                              --------------------

    (1) Normal Intensity..: _                  (8) Green.............: _
    (2) Intensified.......: _                  (9) Neutral (white)...: _
    (3) Blinking..........: _                 (10) Pink..............: _
    (4) Cursive/Italic....: _                 (11) Red...............: _
    (5) Underlined........: _                 (12) Turquoise.........: _
    (6) Reversed Video....: _                 (13) Yellow............: _
    (7) Blue..............: _

    Dynamic Attribute Parameter:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUDYNAT Window
Other Submenu, Text Related Subprograms Submenu
Build Dynamic Attribute Option

CSUEMLEN Subprogram

CSUEMLEN	Description
What it does	Determines the number of characters (bytes) required to display an edit mask. This subprogram receives the name of an edit mask and the format of the field to which the edit mask is applied. It returns the number of characters (bytes) required to display the edit mask.
PDAs used	CSAEMLEN CSASTD
Files accessed	None

Driver Menu Option

```
 CTEEMLEN           N a t u r a l  C o n s t r u c t          CTEMLEN1
 Aug 14              Driver for subprogram CSUEMLEN             1 of 1

Edit Mask.....: _____________________________________________________
Field Format..: __

Display Length:


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUEMLEN Window
Other Submenu, Text Related Subprograms Submenu
Calculate Bytes to Display Emask Option

CSUENDX Subprogram

CSUENDX	Description
What it does	Generates the end of a user exit prompt. This subprogram is used by sample subprograms that generate multiple user exits. Call this subprogram after each user exit is generated. (You do not need to call this subprogram after the last user exit.)
PDAs used	None
Files accessed	None

Driver Menu Option

```
CTEENDX             N a t u r a l   C o n s t r u c t            CTEMAP1
Aug 14                 Driver for subprogram CSUENDX                1 of 1

                  +-----------------------------------+
                  |                                   |
                  |       PRESS ENTER TO EXECUTE.     |
                  |                                   |
                  +-----------------------------------+

                       Read in New Source: _
                      *New Source Name...: ________
                       New Source Library: DEVPR___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUENDX Window
Other Submenu, User Exit Related Subprograms Submenu
Generate End to User Exit Option

CSUFDEF Subprogram

CSUFDEF	Description
What it does	Validates a field definition. This subprogram receives the Natural format and length of a field and a list of invalid field formats to disallow. To disallow control variables as input variables, for example, list the invalid formats in the CSAFDEF.#INVALID FORMATS field. If the field definition is valid, nothing is returned in CSUFDEF. If the field definition is invalid, CSASTD.MSG and CSASTD.ERROR-FIELD contain an error message and the invalid component of the field (FIELD-FORMAT, DECIMALS, or UNIT).
PDAs used	CSAFDEF CSASTD
Files accessed	None

Driver Menu Option

```
 CTEFDEF             N a t u r a l  C o n s t r u c t         CTEFDEF1
 Aug 14               Driver for subprogram CSUFDEF               1 of 1

Field Format...: _          Invalid Formats: __________
Field Length...: _____


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                               mai
```

Driver for Subprogram CSUFDEF Window
Other Submenu, Validation Subroutines Submenu
Validate Field Definition Option

CSUFRVAR Subprogram

CSUFRVAR	Description
What it does	Returns the parameters and conditions from the model code frames. This subprogram receives a model name and traverses its code frames. It returns the code frame parameters and conditions.
PDAs used	CSAFRVAR CSASTD
Files accessed	NCST-FRAME-LINES NCST-MODEL

Driver Menu Option

```
CTEFRVAR           N a t u r a l  C o n s t r u c t           CTEFRVR1
Aug 14              Driver for subprogram CSUFRVAR              1 of 1

*Model Name: ________________________________

No. Of Conditions : 0
No. Of Frame Parms: 0
+-----------------------------------------+----------------------------------+
|  1__        Conditions                  |      1__  Frame Parameters       |
|  ------------------------------         |     --------------------------   |
|                                         |                                  |
|                                         |                                  |
|                                         |                                  |
|                                         |                                  |
|                                         |                                  |
+-----------------------------------------+----------------------------------+


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                  mai
```

Driver for Subprogram CSUFRVAR Window
Other Submenu, NCST Model/Frame Related Subprograms Submenu
Model Code Frame Information Option

CSUGEN Subprogram

CSUGEN	Description
What it does	Issues a CALLNAT to the Natural Construct Generate function for a specified module. This subprogram receives the names of a model PDA and a model information PDA (CSAMODEL, which must contain the name of the model) and uses the inputs to generate the module code into the Natural source buffer. When the CALLNAT is made to the module, the code is appended to the contents of the Natural source buffer. The source buffer name or type does not change. The specified model PDA must contain the model parameters required for generation.
Note:	This subprogram requires a NATPARM SSIZE of 55 or greater.
Parameters used	CSAGEN CSAMODEL CU--PDA CSASTD
Files accessed	NCST-ADA

CSUHEADS Subprogram

CSUHEADS	Description
What it does	Separates a line of headings into separate headings. This subprogram receives a line of headings and returns three separate headings (each with the length of longest heading).
PDAs used	CSAHEADS CSASTD
Files accessed	None

Driver Menu Option

```
 CTEHEADS             N a t u r a l   C o n s t r u c t           CTEHEAD1
 Aug 14                Driver for subprogram CSUHEADS               1 of 1

Headings: ______________________________   Field Headings Stacked
                                          ---------------------
Field Heading Width: 0



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUHEADS Window
Other Submenu, Text Related Subprograms Submenu
Separate a Line of Headings Option

CSUINCL Subprogram

CSUINCL	Description
What it does	Expands all copycode currently in the edit buffer. This program inserts the source for all copycode (currently in the edit buffer) into the edit buffer.
PDAs used	None
Files accessed	None

Driver Menu Option

```
 CTEINCL            N a t u r a l   C o n s t r u c t           CTEMAP1
 Aug 14                Driver for program CSUINCL                 1 of 1

                  +-------------------------------------+
                  |                                     |
                  |       PRESS ENTER TO EXECUTE.       |
                  |                                     |
                  +-------------------------------------+

                       Read in New Source: _
                      *New Source Name...: ________
                       New Source Library: DEVPR___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Program CSUINCL Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Expand All Copy Codes Option

CSUIS Subprogram

CSUIS	Description
What it does	Checks whether the contents of an alphanumeric field can be converted to a specified format and length. If the format and length are invalid Natural formats, CSASTD.MSG contains an error message when this subprogram is invoked. If the format and length are valid, CSASTD.MSG is blank. In some cases, a user must specify a value using a certain (variable) format and length. For example, the minimum/maximum key values should be valid values corresponding to the format and length of the key. You cannot use the Natural IS function because the format is not known until runtime.
PDAs used	CSAIS CSASTD
Files accessed	None

Driver Menu Option

```
 CTEIS                 N a t u r a l   C o n s t r u c t           CTEIS1
 Aug 14                  Driver for subprogram CSUIS               1 of 1

  Field Value.: __________________________________________________
  Field Format: _
  Field Length: ___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUIS Window
Other Submenu, Validation Subroutines Submenu
Validate Format for Input Value Option

CSULABEL Subprogram

CSULABEL	Description
What it does	Verifies a Natural looping label. This subprogram receives a string of characters and validates it against the Natural label naming convention. If the label is valid, CSASTD.MSG is blank; if the label is invalid, CSASTD.MSG contains an error message.
Parameters used	#PDA-LABEL(A32) CSASTD
Files accessed	None

Driver Menu Option

```
 CTELABEL             N a t u r a l  C o n s t r u c t            CTELABL1
 Aug 14                Driver for subprogram CSULABEL                1 of 1

  Label: ________________________________

  Msg..: __________________________________________________________________


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSULABEL Window
Other Submenu, Validation Subroutines Submenu, Validate a Label Option

CSULENGT Subprogram

CSULENGT	Description
What it does	Builds an input prompt and calculates the length of the heading. This subprogram receives a field name, format, and length. It builds the input prompt from the field headings (if no heading was given, the field name is converted to mixed case) and calculates the length from the format, length, and edit mask. It also returns the heading length and sign option (based on the field format and edit mask).
PDAs used	CSALENGT CSASTD
Files accessed	None

Driver Menu Option

```
 CTELENGT           N a t u r a l  C o n s t r u c t          CTELNGT1
 Aug 14              Driver for subprogram CSULENGT              1 of 1

Field Name....: ________________________________  Field Length....: ______
Field Headings: ______________________________    Field Format....: _
              : _____________________________    Sign............: _
              : _____________________________

Edit Mask.....: ______________________________________________________

Input Prompt..:                                   Heading Length..:
Sg Option.....:                                   Fld Displ Length:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                               mai
```

Driver for Subprogram CSULENGT Window
Other Submenu, Text Related Subprograms Submenu
Calculate Length of a Heading Option

CSULPS Subprogram

CSULPS	Description
What it does	Changes the display language (*Language value) and sets the translation required flag to True. This subprogram displays a list of all available languages supported by Natural. When a new language is selected, it switches the user's Natural session to that language and sets the translation required flag to True.
Parameters used	#PDA-TRANSLATION-REQUIRED (L) CSASTD
Files accessed	SYSDIC-FI

CSUMAX Subprogram

CSUMAX	Description
What it does	Generates the assignment of a maximum field value. This subprogram receives the name, format, and length of a variable and generates the assignment of the maximum value for the field into the edit buffer. It is used when reading a file for all values with a specified prefix, where the suffix extends from the lowest to the highest value.
PDAs used	CSAMAX CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMAX               N a t u r a l   C o n s t r u c t            CTEMAX1
 Aug 14                 Driver for subprogram CSUMAX                 1 of 1

Field : __________________________________________________________________
Format: _
Length: _____
Tab...: __


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUMAX Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Generate Assign of Max Field Val Option

CSUMIMAX Subprogram

CSUMIMAX	Description
What it does	Generates the assignment of a minimum value for a field. This subprogram receives the name of a variable and its format and length. It generates the assignment of the minimum/maximum values for the field into the edit buffer.
PDAs used	CSAMIMAX CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMIMAX           N a t u r a l  C o n s t r u c t           CTEMIMX1
 Aug 14              Driver for subprogram CSUMIMAX              1 of 1

Field : _________________________________________________________________

Format: __       Minimum Value: _     Non Negative Min/Max: _    Tab: __
Length: _____     Descending...: _     DB2 Date/Time Stamp : _


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUMIMAX Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Generate Assign of Min Field Val Option

CSUMODEL Subprogram

CSUMODEL	Description
What it does	Returns information about a Natural Construct model. This subprogram receives the name of a model and returns the model description, generator mode and type, and the names of the model PDA, subprograms, and code frames.
PDAs used	CSAMODEL CSASTD
Files accessed	None

Driver Menu Option

```
CTEMODEL            N a t u r a l  C o n s t r u c t           CTEMODL1
Aug 14               Driver for subprogram CSUMODEL              1 of 1

*Model Name.......: ______________________________
 Model Description:

 No. Modify Subps:      Modify Subps  Code Frames  Clear Subp...:
 No. Code Frames :      ------------  -----------  Read Subp....:
 Generator Mode..:                                 Save Subp....:
 Generator Type..:                                 Pre-Gen Subp.:
 Display Window..:                                 Post-Gen Subp:
 Start Comment...:                                 Doc Subp.....:
 End Comment.....:                                 Pda Name.....:




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUMODEL Window
Other Submenu, NCST Model/Frame Related Subprograms Submenu
NCST Models Information Option

CSUMORE Subprogram

CSUMORE	Description
What it does	Builds the initial assignment for the LEFT-MORE/ RIGHT-MORE array.

This subprogram receives a function (L for the LEFT-MORE array, R for the RIGHT-MORE) and the number of panels used by a program. These arrays contain the prompts displayed at the top left or right corner of panels. The prompts indicate the number of panels located to the left or right of the current panel.

For example, to generate the initial value for the LEFT-MORE-PROMPT array for a program with two panels, enter:

```
CSAMORE.#LEFT-RIGHT = 'L'
CSAMORE.#MAX-WINDOW = 2
```

The subprogram writes the following to the source buffer:

```
INIT < '','<1 more' >
```

To generate the initial value for the RIGHT-MORE-PROMPT array for a program with two panels, enter:

```
CSAMORE.#LEFT-RIGHT = 'R'
```

The subprogram writes the following to the source buffer:

```
INIT < '1 more >','' >
```

Note: Use a scalar field rather than an occurrence of this array. Before the map is displayed, assign the array occurrence to the scalar field. Using arrays on maps makes them difficult to maintain and less suitable to use as standard layouts.

Note: If the value of *Language is not 1 during generation, the word “more” is not included in the initial values.

CSUMORE	Description (continued)
PDAs used	CSAMORE CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMORE            N a t u r a l  C o n s t r u c t            CTEMORE1
 Aug 14               Driver for subprogram CSUMORE                 1 of 1

Left/Right:  _ (L or R)
Max Windows: __


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUMORE Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Build Left/Right/More Prompt Option

CSUMPBOX Subprogram

CSUMPBOX	Description
What it does	Handles the map edit buffer. This subprogram receives a function and parameters (in CSAMPBOX). It initializes the map edit buffer or generates variable, array, and text control blocks into the edit buffer.
PDAs used	CSAMPBOX CSASTD
Files accessed	None

CSUMPCPR Subprogram

CSUMPCPR	Description
What it does	Replaces the map settings in the edit buffer with values from the CSAMPSET parameter data area.
PDAs used	CSAMPSET CSASTD
Files accessed	None

CSUMPDUP Subprogram

CSUMPDUP	Description
What it does	Checks for the duplication of fields on a map. This subprogram checks whether there are any fields duplicated in the CSAMPFLD.FIELD-INFO(*) structure. If there are duplicate fields, CSASTD.MSG contains an error message when this subprogram is invoked.
PDAs used	CSAMPFLD CSASTD
Files accessed	None

CSUMPLAY Subprogram

CSUMPLAY	Description
What it does	Loads the map layout into the edit buffer and returns the map settings. This subprogram receives the name, layout, and type of map and loads the specified map into the edit buffer. It returns the map settings.
PDAs used	CSAMPSET CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMPLAY           N a t u r a l   C o n s t r u c t            CTEMPLY1
 Aug 14              Driver for subprogram CSUMPLAY                1 of 1

*Layout..: ________      Error Code :             Dc:     Zp............:
                         Map Version:             Ps:     Pm............:
                         Profile....:             Ls:     Cursor Skip...:

 Delimiter Class..:                                       Std Keys......:
 Ad...............:                                       Justification :
 Delimiter Char...:                                       Col Shift.....:
 Cd...............:                                       Case Deflt....:

 Write Statement..:      CV.........:                     Auto Rule Rank:
 Input Statement..:      Filler Char:                     Enforce Attr..:

 Help.............:
 Help-As-Fld-Deflt:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUMPLAY Window
Other Submenu, Map Related Subprograms Submenu
Load Map Layout and Settings Option

CSUMPMMS Subprogram

CSUMPMMS	Description
What it does	Merges the settings for two maps. This subprogram merges the map settings from CSAMPSET and CSAMPOUT. The settings in CSAMPSET override the settings in CSAMPOUT and the result is stored in CSAMPOUT.
PDAs used	CSAMPSET CSAMPOUT
Files accessed	None

CSUMPOVL Subprogram

CSUMPOVL	Description
What it does	Checks the boundary on a map and determines if there are overlapping fields. This subprogram checks whether the fields specified in CSAMPFLD exceed the line size or page size of the available map panel. The available map panel is a block of consecutive lines on the panel. This block is determined by the specified page and line size, excluding the map layout and any PF-keys. The fields on the map cannot overlay the layout or PF-keys.
PDAs used	CSAMPFLD CSASTD
Files accessed	None

CSUMPREG Subprogram

CSUMPREG	Description
What it does	Determines the available map area in a map layout. This subprogram determines the first and last line on a map that is available for editing in a specified map layout.
PDAs used	CSAMPREG CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMPREG           N a t u r a l  C o n s t r u c t          CTEMPRG1
 Aug 14              Driver for subprogram CSUMPREG             1 of 1


 *Layout: ________   First Available Line:        Layout Page Size:
                     Last  Available Line:        Layout Line Size:




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                               mai
```

Driver for Subprogram CSUMPREG Window
Other Submenu, Map Related Subprograms Submenu
Find Available Area in Layout Option

CSUMPTAB Subprogram

CSUMPTAB	Description
What it does	Calculates the absolute field coordinates on a map and creates the field prompts. This subprogram receives field information from CSAMPFLD and returns the absolute field positions and prompts in CSAMPX-Y. Dots are added to each field prompt in a region to extend its length to that of the longest prompt in that region (... for ISA format and . . . for SAA format). For more information about the data returned, see the CSAMPX-Y data area in the SYSCST library.
PDAs used	CSAMPFLD CSAMPX-Y CSASTD
Files accessed	None

CSUMPTST Subprogram

CSUMPTST	Description
What it does	Tests the map specifications for the map currently in the edit buffer.
PDAs used	CSAMPTST CSASTD
Files accessed	None

Driver Menu Option

```
 CTEMPTST          N a t u r a l  C o n s t r u c t           CTEMTST1
 Aug 14             Driver for subprogram CSUMPTST              1 of 1

   Read in New Map: _            Page Size: 23_
  *Map Name.......: ________     Line Size: 80_
   Map Library....: DEVPR___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUMPTST Window
Other Submenu, Map Related Subprograms Submenu
Test Map Specifications Option

CSUNATFM Subprogram

CSUNATFM	Description

What it does	Builds a valid Natural format definition from the formats and lengths specified.
	This subprogram receives the format and length values and combines these to build a valid Natural format string. For example, if you specify:
	`CSANATFM.FIELD-LENGTH = 9.0`
	`CSANATFM.FIELD-FORMAT = 'P'`
	CSUNATFM produces the following output:
	`CSANATFM.#Natural-FORMAT = P9`

PDAs used	CSANATFM CSASTD
Files accessed	None

Driver Menu Option

```
CTENATFM              N a t u r a l   C o n s t r u c t            CTENTFM1
Aug 14                 Driver for subprogram CSUNATFM                1 of 1

 Field Format: _         Natural Format:
 Field Length: _____


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUNATFM Window
Other Submenu, General Utility Subprograms Submenu
Build Natural Format Option

CSUNEWX Subprogram

CSUNEWX	Description
What it does	Generates a new user exit prompt. This subprogram receives the name of a user exit and generates a starting point (DEFINE EXIT *exit-name*, for example) for the user exit. It initiates a new user exit for sample subprograms that are capable of generating more than one exit.
PDA used	CSANEWX
Files accessed	None

Driver Menu Option

```
CTENEWX          N a t u r a l  C o n s t r u c t      CTENEWX1
Aug 14            Driver for subprogram CSUNEWX          1 of 1

             User Exit Name: ________________________________

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--
      help  retrn quit
```

Driver for Subprogram CSUNEWX Window
Other Submenu, User Exit Related Subprograms Submenu
Generate New User Exit Prompt Option

CSUPARMS Subprogram

CSUPARMS	Description
What it does	Returns the value of a NATPARM parameter. This subprogram receives a NATPARM parameter and returns its corresponding value. Valid NATPARM parameters are: CF, DC, IA, ID, KD, ML, TB, and UL For more information about the INPUT/OUTPUT parameters for this subprogram, see the CSAPARMS data area in the SYSCST library.
PDAs used	CDUPARMA CSASTD
Files accessed	None

Driver Menu Option

```
 CTEPARMS             N a t u r a l  C o n s t r u c t            CTEPARM1
 Aug 14                Driver for subprogram CSUPARMS                1 of 1

  Parameter....: __  (ID,CF,UL,TB,IA,DC,KD,ML)
  Alpha Value..:
  Numeric Value:





Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUPARMS Window
Other Submenu, General Utility Subprograms Submenu
Get a NATPARM Parameter Value Option

CSUPARTY Subprogram

CSUPARTY	Description
What it does	Identifies Natural data types and returns the byte length. This subprogram receives the format and length for a data type and indicates whether it is a valid Natural data type. If it is, this subprogram returns the byte length.
Parameters used	CSAPARTY CSASTD
Files accessed	None

CSUPPER Program

CSUPPER	Description
What it does	Converts the contents of the source buffer to upper case. This program reads through the source buffer and converts specified lower case characters to upper case.
PDAs used	None
Files accessed	None

Driver Menu Option

```
 CTEPPER           N a t u r a l   C o n s t r u c t          CTEMAP1
 Aug 14                Driver for program CSUPPER              1 of 1

                  +------------------------------------+
                  |                                    |
                  |       PRESS ENTER TO EXECUTE.      |
                  |                                    |
                  +------------------------------------+

                      Read in New Source: _
                     *New Source Name...: ________
                      New Source Library: DEVPR___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Program CSUPPER Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Convert Source to Upper Case Option

CSUREADS Subprogram

CSUREADS	Description
What it does	Reads the specification parameters for a module. This subprogram receives the name of a source module. If the module was generated using Natural Construct, the subprogram reads the source code and returns the model parameter data area (PDA) containing the parameters used to generate the module. You can use the passed model PDA to call the model subprograms for the model used to generate the module. This subprogram also returns a data area that describes the model and lists the names of the model subprograms. This subprogram requires a NATPARM SSIZE of 55 or greater.
Parameters used	#READ-THIS-MODULE(A8) CSAMODEL CU--PDA CSASTD
Files accessed	NCST-ADA SYSTEM-FUSER

Note: If you know the name of the model used to generate the specified module, you can pass its model PDA to CSUREADS rather than CU--PDA. After the call to CSUREADS, the model PDA is populated with the parameters used to generate the specified module.

CSUREF Subprogram

CSUREF	Description
What it does	Generates referential integrity checks against foreign files. This subprogram is typically called three times: once to generate the data structures (DATA) required by the generated code, once to generate the update edits (UPDATE), and once to generate the delete edits (DELETE). Set the value of CSAREF.FUNCTION-CODE to either DATA, UPDATE, or DELETE. After the first call, this subprogram returns the number of update and delete edits found. This avoids unnecessary subsequent calls.
Parameters used	CSAREF CU--PDA CSASTD
Files accessed	SYSDIC-RL SYSDIC-FI

CSUSCAN Subprogram

CSUSCAN	Description
What it does	Scans for the existence of a string in the edit buffer. This subprogram receives a string and scans for (not absolute) the existence of the string in the edit buffer.
PDA used	CSASCAN
Files accessed	None

Driver Menu Option

```
 CTESCAN               N a t u r a l  C o n s t r u c t          CTESCAN1
 Aug 14                 Driver for subprogram CSUSCAN                1 of 1

  String..: ____________________________________________________________
  Absolute: _ (Mark if scan string need not be delimited by special chars)
  Found...: _

  Read in New Source: _
 *New Source Name...: ________
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CSUSCAN Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Scan for Existence of a String Option

CSUSELFV Subprogram

CSUSELFV	Description

What it does	Selects fields/variables from views, LDAs, or PDAs.
	
	This subprogram selects up to 40 fields/variables from up to 6 different views, LDAs, or PDAs and appends the selected fields/variables to CSASELFV. Existing fields/variables in CSASELFV cannot be re-selected.
	
	When selecting from data areas, you cannot select the following:
	• constants
	• more than one structure
	
	If you specify the select all option, then the first structure in the data area is selected.
	
	The invoking subprogram should issue an initial RESET statement to clear the structures in CSASELFV, such as:
	
	`RESET CSASELFV`
	`CSASELFV.GENERAL-INFORMATION`
	`CSASELFV.FIELD-SPECIFICATION(*)`

PDAs used	CSASELFV CSASTD
Files accessed	None

CSUSETKY Subprogram

CSUSETKY	Description
What it does	Returns the PF-key definitions from the Control record. This subprogram is used to support variable PF-keys within Natural Construct. The PF-key names are returned in the CSASETKY.#PF-NAME(*) array. The index for each array element corresponds to the PF-key number. The following example indicates that PF1 is named "help": `#PF-NAME(1) = 'help'`
PDAs used	CSASETKY CSASTD
Files accessed	NCST-CONTROL

Driver Menu Option

```
CTESETKY          N a t u r a l   C o n s t r u c t          CTESETK1
Sep 01              Driver for subprogram CSUSETKY              1 of 1

         Pf Name          Pf Number               Pf Key
         -------          ---------               ------
          main          Main......: 12        Pf Main......: PF12
          retrn         Return....: 2         Pf Return....: PF2
          quit          Quit......: 3         Pf Quit......: PF3
          test          Test......: 4         Pf Test......: PF4
          bkwrd         Backward..: 7         Pf Backward..: PF7
          frwrd         Forward...: 8         Pf Forward...: PF8
          left          Left......: 10        Pf Left......: PF10
          right         Right.....: 11       Pf Right.....: PF11
          help          Help......: 1         Pf Help......: PF1
                        Available1: 5         Pf Available1: PF5
                        Available2: 6         Pf Available2: PF6
                        Available3: 9         Pf Available3: PF9

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUSETKY Window
Other Submenu, General Utility Subprograms Submenu
Find PF Key Related Information Option

CSUSETW Subprogram

CSUSETW	Description

What it does	Returns the SET CONTROL parameters to define a window.
	
	This subprogram receives the parameters for a window (such as frame, line size, column size, base line, and base column). It returns the SET CONTROL parameters to define the window. For example, if the parameters are:
	
	`CSASETW.FRAME=TRUE`
	`CSASETW.LINE-SIZE=70`
	`CSASETW.COLUMN-SIZE=5`
	
	this subprogram returns:
	
	`CSASETW.SET-CONTROL.PARM='WBFL70C5'`

PDAs used	CSASETW CSASTD
Files accessed	None

Driver Menu Option

```
 CTESETW            N a t u r a l  C o n s t r u c t           CTESETW1
 Aug 14                Driver for subprogram CSUSETW                1 of 1

  Frame......: _ Line Size..: ___  Base Line..: ___  Required Width : ___
                 Column Size: ___  Base Column: ___  Required Height: ___

  Set Control Parm:


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUSETW Window
Other Submenu, Text Related Subprograms Submenu
Build Window Settings Option

CSUSORT Program

CSUSORT	Description
What it does	Sorts a 2-dimensional array based on specified column positions. This subprogram receives a 2-dimensional array and sorts the array based on the desired column positions. A Natural SORTSIZE is not required because the sort uses an internal bubble sort algorithm. For an example of how to call this subprogram, see the CSASORT parameter data area.
Parameters used	CSASORT #SORT-DATA(A1/1:V,1:V) CSASTD
Files accessed	None

CSUSPLIT Program

CSUSPLIT	Description
What it does	Splits lines in the source buffer that are longer than 72 characters. Only lines with code extending beyond column 72 are split; lines with comments extending beyond column 72, but not code, are ignored. If a text string (enclosed within quotes) extends beyond column 72, the entire string is moved to the next line.
PDAs used	None
Files accessed	None

Driver Menu Option

```
 CTESPLIT            N a t u r a l   C o n s t r u c t          CTEMAP1
 Aug 14                Driver for program CSUSPLIT               1 of 1

                  +-----------------------------------+
                  |                                   |
                  |       PRESS ENTER TO EXECUTE.     |
                  |                                   |
                  +-----------------------------------+

                       Read in New Source: _
                      *New Source Name...: ________
                       New Source Library: DEVPR___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Program CSUSPLIT Window
Other Submenu, Edit Buffer Related Subprograms Submenu
Split Long Lines in Edit Buffer Option

CSUSUB Program (Mainframe)

CSUSUB	Description
What it does	Submits a job for execution. The JCL for the job must be in the source buffer. This subprogram is used in conjunction with the CSUSUB command. For information, see **JCL Submit Utility (Mainframe)**, page 905 in *Natural Construct Generation User's Manual*.
PDAs used	None
Files accessed	None

CSUSUBP Subprogram

CSUSUBP	Description
What it does	Returns information about a Natural Construct model subprogram, such as the PF-key settings and the window sizes. This subprogram receives the name of a model subprogram and returns information about that subprogram. The information corresponds to the data accessed through the Maintain Subprogram function.
PDAs used	CSASUBP CSASTD
Files accessed	NCST-SUBPROGRAM

Driver Menu Option

```
CTESUBP             N a t u r a l   C o n s t r u c t            CTESUBP1
Aug 15                 Driver for subprogram CSUSUBP                 1 of 1

Subprogram Name: ________
Description....:

Backward Forward Flag:    Window Length :      Key Name  No. Other Keys: _
Left Right Flag......:    Window Columns:      --------
Test Key Flag........:








Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CSUSUBP Window,
Other Submenu, NCST Model/Frame Related Subprograms Submenu,
NCST Subprograms Information Option

CSUTEST Program

CSUTEST	Description
What it does	Tests the subprograms for Natural Construct-generated models. This program tests the individual subprograms for Natural Construct-generated models. For information, see **Testing the Model Subprograms**, page 178.
PDAs used	None
File accessed	NCST-SUBPROGRAM NCST-CONTROL

Driver Menu Option

```
CSUTEST              N a t u r a l  C o n s t r u c t            CSUTESM1
Aug 14                  Single Module Test Program                04:54 PM

Code Function            *Model: ________________________________
---- ------------------   Number all subprograms to be executed
 R   Release Variables     |                      |
 *   Execute All Subp.    V                      |
1-9  Execute One Subp.    _  Clear : ________   V
 E   Edit source          _  Mod  1: ________   _ Mod  6: ________
 C   Clear Edit Buffer    _  Mod  2: ________   _ Mod  7: ________
 ?   Help                 _  Mod  3: ________   _ Mod  8: ________
 .   Terminate            _  Mod  4: ________   _ Mod  9: ________
---- ------------------   _  Mod  5: ________   _ Mod 10: ________
 _                        _  Pregen: ________   _ Save  : ________
           Source         _  Documt: ________   _ Postgn: ________
           Lines
     Total:  133                               Frame Parameter or Exit Name
                          _  Other : ________ ________________________________
                          _  Other : ________ ________________________________
                          _  Other : ________ ________________________________
                          _  Other : ________ ________________________________
  Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
        help  retrn quit                                                  mai
```

Single Module Test Program Panel
Other Submenu, NCST Model/Frame Related Subprograms Submenu
Test NCST Generated Models Option

CSUTLATE Subprogram

CSUTLATE	Description
What it does	Translates message text at runtime. This subprogram receives a message number and position value and retrieves the appropriate text. If the message text contains multiple items delimited by a slash (/), the position value identifies which text is translated. This subprogram is invoked from the CSUCURS and CSUCURS1 subprograms.
Parameters used	CSATLATE CSASTD
Files accessed	SYSTEM-FUSER

CSUTRANS Subprogram

CSUTRANS	Description
What it does	Translates screen prompts before they are displayed. This subprogram receives a defined data structure (typically a translation LDA) containing SYSERR message numbers and translates them into the appropriate text. For more information about SYSERR message numbers, see **Using SYSERR References**, page 496 CSUTRANS reads the supplied data structure, searching for one of two message number patterns: *NNNN or *NNNN.A, where *NNNN identifies the message number and .A identifies a position within the message number. If a message number of the type *NNNN is located, the entire SYSERR message is retrieved. If a message number of type *NNNN.A is located, the portion of the message corresponding to the .A notation is retrieved. A message number can have up to 15 positions: the values 1 to 9 represent the first nine positions, and the values A to F represent the 10th to 15th positions. To locate the text corresponding to a message number, specify the library in which the SYSERR message numbers and text reside. By default, CSUTRANS checks the SYSERR message CSTLDA library. In most cases, you will create your own SYSERR message library. If you do, enter the library name in the #MESSAGE-LIBRARY field. In addition to retrieving the appropriate language message text, CSUTRANS searches for any formatting characters and formats the text as appropriate. For more information about formatting characters, see **Formatting SYSERR Message Text**, page 503. CSUTRANS requires a specific data structure. The example on the following page shows the translation LDA for the Standard Parameters panel for the Batch model:

CSUTRANS **Description (continued)**

```
* * **SAG TRANSLATION LDA
* * * used by CTETRANS.
1 CTE-MAL

  2 TEXT                         /* Corresponds to syserr message
    3 #GEN-PROGRAM                 A   20 INIT<'*2000.1,.'>
    3 #SYSTEM                      A   20 INIT<'*2000.2,+'>
    3 #GDA                         A   20 INIT<'*2000.3,>'>
    3 #TITLE                       A   20 INIT<'*2001.1,+/16'>
    3 #DESCS                       A   20 INIT<'*2001.2,.'>
    3 #GDA-BLOCK                   A   20 INIT<'*2001.3,>'>
    3 #MAP-HEADER1                 A   20 INIT<'*2049.1,./18'>
    3 #MAP-HEADER2                 A   20 INIT<'*2049.2,>/18'>
    3 #USE-MSG-NR                  A   20 INIT<'*2050.1,.'>
    3 #PASSWORD-CHECK              A   20 INIT<'*2050.2,./20'>
  2 TEXT
    3 TRANSLATION-TEXT
      4 TEXT-ARRAY                 A    1 (1:200)
  2 ADDITIONAL-PARMS
    3 #MESSAGE-LIBRARY             A    8 INIT<'CSTLDA'>
    3 #LDA-NAME                    A    8 INIT<'CTE-MAL'>
    3 #TEXT-REQUIRED               L      INIT<TRUE>
    3 #LENGTH-OVERRIDE             I    4  /* Length to translate
```

Other details about the structural elements include:

- The first comment line (**SAG TRANSLATION LDA) indicates that this is a translation LDA. During a static install, Natural Construct scans for this comment line and replaces the SYSERR numbers with the appropriate text.
- The CTE-MAL level 1 structure name is typically the LDA name; use this qualifier whenever the variables are accessed.
- The level 3 variables (#GEN-PROGRAM, #SYSTEM, #GDA, etc.) are screen prompts that are initialized with a valid SYSERR number. All SYSERR numbers use the *NNNN.A notation and are listed in sequential order.

CSUTRANS	Description (continued)
Note:	This sequence does not apply to positions after the period within the *NNNN.A notation. For example, you can list *2000.2 before *2001.1. • The TEXT-ARRAY value must match the total number of bytes in all prompt variables to be translated. • The #MESSAGE-LIBRARY value indicates the SYSERR library where the text is stored. • The #TEXT-REQUIRED logical indicates whether translation is required, If it is, this field ensures that translation is performed only once.
PDA used	CSATRANS CSASTD
File accessed	SYSTEM-FUSER

Driver Menu Option

```
CTETRANS          ***** Natural Related subprograms *****
Oct 21               - Driver for subprogram CSUTRANS -              1 of 1

Translation LDA .... CTE-MAL

Input Parameters ... #GEN-PROGRAM *2000.1,.___________
                     #SYSTEM *2000.2,+___________
                     #GDA *2000.3,>___________
                     #TITLE *2001.1,+/16________
                     #DESCS *2001.2,.___________
                     #GDA-BLOCK *2001.3,>___________
                     #MAP-HEADER1 *2049.1,./18________
                     #MAP-HEADER2 *2049.2,>/18________
                     #USE-MSG-NR *2050.1,.___________
                     #PASSWORD-CHECK *2050.2,./20________
                     #MESSAGE-LIBRARY CSTLDA__
                     #LDA-NAME CTE-MAL_
                     #TEXT-REQUIRED X
                     #LENGTH-OVERRIDE __________0
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help        quit        reset       bkwrd frwrd       right left
```

Sample Driver for Subprogram CSUTRANS Window
Natural Submenu, Retrieve Application Error Messages
Retrieve Block Messages Option

Note: This driver is provided as a sample only. Because the screen prompts that will be translated by CSUTRANS vary depending on the application you are developing, the driver must be tailored to the application.

CSUXCHK Subprogram

CSUXCHK	Description
What it does	Scans for the existence of a user exit in the edit buffer. This subprogram receives the name of a user exit and scans the edit buffer for that name.
PDA used	CSAXCHK
Files accessed	None

Driver Menu Option

```
   CTEXCHK              N a t u r a l   C o n s t r u c t             CTEXCHK1
   Aug 14                 Driver for subprogram CSUXCHK                  1 of 1

     User Exit Name....: ________________________________
     Found.............:

     Read in New Source: _
    *New Source Name...: ________
     New Source Library: DEVPR___


  Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
        help  retrn quit                                                 mai
```

Driver for Subprogram CSUXCHK Window
Other Submenu, User Exit Related Subprograms Submenu
Validate Format for Input Value Option

CSU2LONG Subprogram

CSU2LONG	Description
What it does	Converts a long variable name to an abbreviation. This subprogram receives a long character string (32 characters) and a desired length, and returns the truncated string (abbreviation). The sixth position of the string is the first position truncated. If no length is given, the default is 30. If the long string is not longer than the desired length, the string is still truncated. For example, if the long string is "THIS-IS-A-LONG-VARIABLE" and the desired length is 20, the short string is "THIS-A-LONG-VARIABLE".
Note:	Use this subprogram when you add characters to a file or field name that is already 32 characters long.
PDA used	CSA2LONG
Files accessed	None

Driver Menu Option

```
 CTE2LONG            N a t u r a l  C o n s t r u c t           CTE2LNG1
 Aug 14               Driver for subprogram CSU2LONG               1 of 1

  Long Name.....: ______________________________
  Maximum Length: ___

  Short Name....:


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                  mai
```

Driver for Subprogram CSU2LONG Window, Other Submenu
General Utility Subprograms Submenu, Shorten a Long Variable Name Option

Predict-Related Subprograms (CPU*)

The subprograms described in this section retrieve information from the Predict data dictionary. While some of these subprograms generate code, most supply information to the calling subprogram and the calling subprogram generates the code.

Note: If you use Software AG's Net-Work, the Predict data can reside on a platform other than the platform on which Natural Construct is running.

Driver programs for many of the supplied programs and subprograms are available through the Driver menu option on the Administration main menu. If a driver program is available, its location is listed in the **Driver Menu Option** section for the program or subprogram.

For information about invoking the driver programs, see **Drivers Menu Function**, page 79.

With Natural Security Installed

If Natural Security is installed, the Predict-related subprograms restrict access to file and field information. Users can only retrieve information for files linked to the current application.

While generating a program, the program may access information about the same file many times. To avoid security checks each time, the access subprograms use the FILE-CODE field. This INPUT/OUTPUT field accesses file information and acts as a cipher code to avoid multiple security checks on the same file; it is available for all supplied subprograms.

If you are developing under Natural Security, include the FILE-CODE field in the model PDA for each file used multiple times during generation. The FILE-CODE field is passed in the PDA of the access subprogram and reassigned back to the model PDA after each call.

Example of using the FILE-CODE field

To avoid security checks for each access, the model subprogram that invokes CPUEL contains the following statements:

```
ASSIGN CPAEL.FILE-CODE = #PDA-FILE-CODE
CALLNAT 'CPUEL' CPAEL CSASTD
ASSIGN #PDA-FILE-CODE = CPAEL.FILE-CODE
```

Note: For an example of using these subprograms to restrict access to file and field information, see the CUSCGPR program in the SYSCST library.

The following sections describe subprograms that retrieve information from Predict.

CPU-OBJ Subprogram

CPU-OBJ	Description
What it does	Generates an external data area based on a Predict file view. This subprogram receives the view name and a set of logical variables that define the generation options. It generates an external data area structure to match the view. It can also generate the C# variables for each C* variable that corresponds to an MU or PE and/or includes the corresponding REDEFINE fields for redefined fields or superdescriptors. For information about the INPUT/OUTPUT parameters, see the CPA-OBJ parameter data area in the SYSCST library.
PDAs used	CPA-OBJ CSASTD
Files accessed	SYSDIC-EL SYSDIC-FI

Driver Menu Option

```
 CTE-OBJ            N a t u r a l  C o n s t r u c t          CTE-OBJ1
 May 12               Driver for subprogram CPU-OBJ              1 of 1

*File: ________________________________


Build Redefines..: _    Structure Level: _
SuperDe Redefines: _    Joined Fld Name: ________________________________
Cstars...........: _    Joined Length..: ___

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CPU-OBJ Window
Predict Submenu, Generate Data Areas Submenu, External Option

CPU-OBJ2 Subprogram

CPU-OBJ2	Description
What it does	Issues CALLNAT to the #CALLNAT subprogram and passes information about elements that make up an object. This subprogram receives: • a view name • a key name • a set of options • the name of a passed subprogram to CALLNAT An object is derived from view and key names. The view and key names are based on intra-object relationships defined in Predict (for example, ORDER-HEADER-HAS-ORDER-LINES). The elements of an object are the individual fields in the files that make up the object. This subprogram traverses the object tree and checks each element. For each element, it CALLNATs the #CALLNAT subprogram and passes it information about the element (for example, the format, length, and type). You can set options to limit or extend the number of elements to check (for example, whether to include all field redefinitions or just the lowest levels). This subprogram replaces CPU-OBJ; for all new development, use CPU-OBJ2 instead of CPU-OBJ.
Parameters used	CPA-OBJ2 CPA-ODAT CU--PDA #PASS(A1/1:V) CSASTD
Files accessed	SYSDIC

CPU-OREL Subprogram

CPU-OREL	Description
What it does	Adds entity information to a table. This subprogram receives the name of an object and information about each entity belonging to the object. It adds this information to a table. For more information, see the CPA-OREL.ENTITY(*) parameter data area. Optionally, it can display tracing information.
Parameters used	CPA-OREL CU__PDA CSASTD
Files accessed	SYSDIC-RL SYSDIC-FI SYSDIC-EL

CPU-VIEW Subprogram

CPU-VIEW	Description
What it does	Generates field definitions based on the contents of a Predict view. This subprogram receives the name of a Predict view and a set of logicals defining the options to be generated. It generates the view definition as it should appear in the DEFINE DATA . . . END-DEFINE block of a Natural program, subprogram, or helproutine. **Note:** This subprogram differs from CPU-OBJ in that it generates internal rather than external data structures. This subprogram can also generate the C# variables for each C* variable that corresponds to an MU (multiple-valued) or PE (periodic group), and/or includes the corresponding REDEFINE fields for redefined fields or superdescriptors. You can use this subprogram to define a structure based on a view in Predict. The format and length for each field is generated. For more information about the INPUT/OUTPUT parameters for this subprogram, see the CPA-VIEW parameter data area in the SYSCST library.
PDAs used	CPA-VIEW CSASTD
Files accessed	SYSDIC-EL SYSDIC-FI

Driver Menu Option

```
CTE-VIEW           N a t u r a l  C o n s t r u c t          CTE-VEW1
May 12              Driver for subprogram CPU-VIEW              1 of 1

*File....: ________________________________
 View....: ________________________________       Gen 01 Level......: _
 Omit Fld: ________________________________

 Variable Indexes : _    Include Hyper DE...: _    Include MU Counter: _
 Build Redefines..: _    Include Phonetic DE: _    Include PE Counter: _
 SuperDe Redefines: _    Include Sub DE.....: _    Include MU Hyper..: _
 Specify Formats..: _    Include Super DE...: _    Include PE Hyper..: _
 Cstars...........: _    Redefine Cstars....: _

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                mai
```

Driver for Subprogram CPU-VIEW Window
Predict Submenu, Generate Data Areas Submenu, Internal Option

CPUEL Subprogram

CPUEL	Description
What it does	Returns Predict information about a field in a file. This subprogram finds a field in a Predict file and returns information about the field.
PDAs used	CPAEL CSASTD
File accessed	SYSDIC-EL

Driver Menu Option

```
 CTEEL               N a t u r a l  C o n s t r u c t          CTEEL11
 Aug 14                Driver for subprogram CPUEL               1 of 2

*File Name..: ________________________________ DDM Prefix: ________________
*Field Name : _________________________________
 Simple Outputs: _

Fld Found...:      Adabas Fld Name:      Fld Format....:     Field Uq :
Ver Found...:      Fld Length.....:      Predict Format:     De Type..:
Lvl Number..:      Sign...........:      Suppression...:     Gr Struct:
Occurrences.:      Fld Type.......:      A/Descend.....:     Pe Ind...:
                   Fld Redefined  :      Rank..........:

Edit Mask...:                                        Field Headings:
DDM Fld Name:
Index Name..:
Fld Sequence:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                      left  right mai
```

Driver for Subprogram CPUEL Window 1
Predict Submenu, Field Information Submenu, Single Field Option

```
CTEEL                 N a t u r a l  C o n s t r u c t            CTEEL21
Aug 14                   Driver for subprogram CPUEL                 2 of 2

File Name..:
Field Name :

LEVEL
-----
DDM Field Name                    Field Type    Is Redefined









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                      left  right mai
```

Driver for Subprogram CPUEL Window 2
Predict Submenu, Field Information Submenu, Single Field Option

CPUELDE Subprogram

CPUELDE	Description
What it does	Returns a description attribute from a specified file. This subprogram receives the name of a file and finds a description attribute. It returns the names of all fields that have the DESCRIPTION keyword.
Parameters used	CPAELDE CSASTD
Files accessed	SYSDIC-FI SYSDIC-EL SYSDIC-KY

CPUELKY Subprogram

CPUELKY	Description
What it does	Returns keywords linked to a field in a specified file. This subprogram receives the name of a file and field; it returns keywords linked to the field.
Parameters used	CPAELKY CSASTD
Files accessed	SYSDIC-FI SYSDIC-EL SYSDIC-KY

CPU-FREL Subprogram

CPU-FREL	Description
What it does	Retrieves information about a foreign relationship and CALLNATs a pass-through subprogram. This subprogram passes CPA-FREL, CU--PDA, and CSASTD to the pass-through subprogram.
Parameters used	CPARLRD CU--PDA CPA-FREL CSASTD
Files accessed	SYSDIC-FI SYSDIC-EL

CPUELNX Subprogram

CPUELNX	Description
What it does	Returns field-by-field information if it is called repeatedly. This subprogram receives the name of a Predict file, the CPAELNX data area (contains options for field types), and the CPRELNX data area (contains information about current processing), and logically reads through the fields in the file. For information about the INPUT/OUTPUT parameters, see the CPAELNX parameter data area in the SYSCST library.
Note:	CPRELNX contains reserved variables that keep track of the current position; it must not be modified by the calling program.
PDAs used	CPAELNX CPRELNX CSASTD
Files accessed	SYSDIC-EL SYSDIC-FI

Driver Menu Option

```
 CTEELNX            N a t u r a l   C o n s t r u c t           CTEENX11
 Aug 14                Driver for subprogram CPUELNX                1 of 2

*File Name....: ________________________________ First Time : X EOF.....:
 DDM Prefix...: ________________

Redef Base Fld: _  Super Subs: _  Mus.......: _  Nulls Only : _ Counters: _
First Redefine: _  Phonetics : _  Pe Groups : _  Seq Only...: _ Groups..: _
All Redefines : _  Hypers....: _  Pes.......: _  Uq Only....: _ Fillers : _
Max Rede Rank : _  Derived...: _  Mus in Pes: _  VE Only....: _ REDE STR: _

Fld Name......:                                  Fld Type...:
Fld Format....:                                  Length.....:
Predict Format:                                  Sign.......:

Adabas Name...:    Fld Def...:    De Type...:    Fld Count..:     Rank..:
Level Number..:    Fld Uq....:    Pe Ind....:    Occurrences:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                     left  right mai
```

Driver for Subprogram CPUELNX Window 1
Predict Submenu, Field Information Submenu, Get Next Field Option

```
 CTEELNX            N a t u r a l   C o n s t r u c t            CTEENX21
 Aug 14               Driver for subprogram CPUELNX                 2 of 2

        Field Headings
------------------------------
                                IMS Offset....:         Access Lvl:
                                IMS Fld Name..:         Update Lvl:
                                IMS Fld Length:

Index Name..:
DDM Fld Name:

Edit Mask...:
Level Type Trail:    ->    ->    ->    ->    ->    ->    ->
Redefine Trail..:    ->    ->    ->    ->    ->    ->    ->

Fld is Redefined:    Redefine Cnt:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                    left  right mai
```

Driver for Subprogram CPUELNX Window 2
Predict Submenu, Field Information Submenu, Get Next Field Option

CPUELRD Subprogram

CPUELRD	Description
What it does	Reads through the fields in a Predict file, issues a CALLNAT for the specified subprogram for each field, and passes information about the field to the subprogram. This subprogram receives: • the name of a file • the name of a subprogram to CALLNAT • the selection criteria (in CPAELRD.INPUTS) The subprogram traverses the specified file. For each selected field, it CALLNATs the passed subprogram to process the current field (for an example, see the **CPUELRD Subprogram**, page 455).
PDAs used	CPAELRD CU--PDA (model PDA) CSAPASS (redefined as required) CSASTD
Note:	The CSAPASS parameter data area can be redefined as required and used to store additional information that must be preserved between CALLNATs.
File accessed	SYSDIC-EL

Driver Menu Option

```
 CTEELRD              N a t u r a l   C o n s t r u c t            CTEELRD1
 Aug 14                 Driver for subprogram CPUELRD                 1 of 1

*File Name.......: ________________________________  Fld Count......:
*Key Name........: ________________________________  Level..........:
*CALLNAT.........: CTELRDSM                          Max Rede Rank..: _

ReDe Base Fld: _ SPs/SBs..: _ Pes...: _ Pe Group: _ Only VE..: _ Fillers: _
First ReDe...: _ Phonetics: _ Mus...: _ Mu in Pe: _ Only UQ..: _ Derived: _
All ReDe.....: _ Hypers...: _ Groups: _ Counters: _ Only Null: _ Rede St: _

Fld Name  :                                 Format :    PRD Format :
DDM Field :                                 Fld UQ :    Length.....:
Index.... :                                 Type...:    Adabas Name:
Headings  :                                 De Type:    Occurrences:
                                            Pe Type:               :
Edit Mask :                                 Rank...:               :
Type Trail:                                 Redef..:    ReDe Count :
ReDe Trail:
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                  mai
```

Driver for Subprogram CPUELRD Window
Predict Submenu, Field Information Submenu
CALLNAT For Each Field in a File Option

CPUELVE Subprogram

CPUELVE	Description
What it does	Returns the verification rule names for a field in a file. This subprogram finds a field in Predict and returns the names of the verification rules of type N (Natural Construct).
PDAs used	CPAELVE CSASTD
File accessed	SYSDIC-EL

Driver Menu Option

```
 CTEELVE             N a t u r a l   C o n s t r u c t          CTEELVE1
 Aug 14               Driver for subprogram CPUELVE                1 of 1

*File Name : ________________________________     Field Found.........:
*Field Name: _________________________________     Num of Verifications:

                  +-----------------------------------+
                  |  1__   VERIFICATION NAME          |
                  | ------------------------------   |
                  |                                   |
                  |                                   |
                  |                                   |
                  |                                   |
                  |                                   |
                  +-----------------------------------+



Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                  mai
```

Driver for Subprogram CPUELVE Window
Predict Submenu, Field Information Submenu
Get Verification Rule Names Option

CPUEXIST Subprogram

CPUEXIST	Description
What it does	Verifies the existence of a specified Predict object. This subprogram receives the name and type of an object and verifies its existence in Predict.
PDAs used	CPAEXIST CSASTD
Files accessed	SYSDIC-SY SYSDIC-PR SYSDIC-KY SYSDIC-DB SYSDIC-FI SYSDIC-RL SYSDIC-UE

Driver Menu Option

```
 CTEXIST              N a t u r a l  C o n s t r u c t            CTEXST1
 Aug 14                 Driver for subprogram CPUEXIST               1 of 1

  Object Name: ________________________________    Object Exists:
  Object Type: __ (SY,PR,KY,FI,DB,RL,VE)




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CPUEXIST Window
Predict Submenu, Verify Object Existence Option

CPUFI Subprogram

CPUFI	Description
What it does	Returns Predict information about a file. This subprogram receives the name of a file and returns Predict information about that file.
PDAs used	CPAFI CSASTD
File accessed	SYSDIC-FI

Driver Menu Option

```
CTEFI              N a t u r a l  C o n s t r u c t          CTEFI1
Aug 14               Driver for subprogram CPUFI               1 of 1

*File Name: ________________________________       Ripp File Nr..:
 File Type:                                          Ext File  Nr..:

 Master File Name..:
 Primary Seq Field :

 DDM Prefix........:                                IMS DB Number.: 00
 DDM File Name.....:                                 IMS File Level:
 IMS Parent File...:                                 IMS File Nr...: 00
 IMS Root File Name:                                 IMS Seg Type..:
 IMS DBD Name......:                                 IMS DDM Suffix:
 IMS Seg Name......:                                 DDM Matches...:
 IMS Root Seg Name :


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CPUFI Window
Predict Submenu, File Information Option

CPUHOLD Subprogram

CPUHOLD	Description
What it does	Determines the hold field for a file. This subprogram receives the name of a file and determines the hold field for the file. To define a hold field, attach the HOLD-FIELD keyword to the field in Predict.
Parameters used	CPAHOLD CSASTD
Files accessed	SYSDIC-FI SYSDIC-EL

CPUKY Subprogram

CPUKY	Description
What it does	Retrieves information related to a Predict keyword. You can use the keyword comments to store attribute values that can be returned by this subprogram.
Parameters used	CPAKY CSASTD
Files accessed	SYSDIC-KY SYSDIC-EL

CPUREDEF Subprogram

CPUREDEF	Description
What it does	Generates redefinitions for compound keys, superdescriptors, or redefined fields in Predict. This subprogram invokes the CPUXPAND subprogram, which retrieves the components of the field to be redefined. Redefinitions can be generated in either inline or external data area format.
PDAs used	CPAREDEF CSASTD
File accessed	SYSDIC-EL

Driver Menu Option

```
CTEREDEF           N a t u r a l   C o n s t r u c t          CTERDEF1
Aug 14              Driver for subprogram CPUREDEF              1 of 1

*File : ________________________________       Redef Level.........: _
*Field: _______________________________        Change Format N to A: _

 Super Options
 -------------
 Include Deriv Level: _   Inside Histogram: _
 Include Redef Level: _   Omit Format.....: _

 Resets Required:




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CPUREDEF Window, Predict Submenu, Field Information Submenu, Generate Field Redefinition Option

CPURL Subprogram

CPURL	Description
What it does	Returns information about a relationship in Predict. This subprogram receives a Predict relationship name and returns information about the relationship.
PDAs used	CPARL CSASTD
File accessed	SYSDIC-RL

Driver Menu Option

```
CTERL                   N a t u r a l  C o n s t r u c t            CTERL1
Aug 14                    Driver for subprogram CPURL               1 of 1

*Relationship Name: ________________________________ Relationship Found:
                                                      Relationship Type :

       Relationship File                 Relationship Field          Card
 --------------------------------  --------------------------------  ----



     Ddm Relationship Field        Minimum    Average     Maximum
 --------------------------------  -------    --------    -------



Constraint Type Upd:                Db2 Constraint Name:
Constraint Type Del:
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                                 mai
```

Driver for Subprogram CPURL Window
Predict Submenu, Relationship Information Option

CPURLRD Subprogram

CPURLRD	Description
What it does	Retrieves the Predict relationships for a specified file, and optionally a specified type. This subprogram receives: • the name of a file • a relationship type (optional) • the name of a subprogram (in CPARLRD.INPUTS) It finds relationships for the specified file, issues a CALLNAT to the specified subprogram, and passes the information about the relationship to the subprogram for processing.
PDAs used	CPARLRD CU--SYSLIBSPDA (model PDA) CSAPASS (redefined as required) CSASTD
Note:	The CSAPASS parameter data area can be redefined as required and used to store additional information that must be preserved between CALLNATs.
Files accessed	SYSDIC-FI SYSDIC-KL

Driver Menu Option

```
CTERLRD        N a t u r a l   C o n s t r u c t        CTERLRD1
Aug 14           Driver for subprogram CPURLRD            1 of 1

  *File Name.............: ________________________________
   Relationship Type.....: _
  *CALLNAT...............: CTELRDSM
   Relationship Count....:
   Relationship Name.....:
   Relationship File ....:
   Relationship Field....:
   DDM Relationship Field:
   Cardinality...........:
   Minimum...............:
   Average...............:
   Maximum...............:
   DB2 Constraint Name...:
   Constraint Type Upd...:
   Constraint Type Del...:
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10-
      help  retrn quit
```

Driver for Subprogram CPURLRD Window
Predict Submenu, CALLNAT for Each Relationship Option

CPUSUPER Subprogram

CPUSUPER	Description
What it does	Returns the definition for a super/subdescriptor (or DB2 compound key). This subprogram receives the name of a superdescriptor or subdescriptor (or DB2 compound key) and the name of the Predict file or table to which it belongs. It returns information about the derived fields.
PDAs used	CPASUPER CSASTD
File accessed	SYSDIC-EL

Driver Menu Option

```
CTESUPER          ***** Predict Related Subprograms *****         CTESUPR1
Oct 09              - Driver for subprogram CPUSUPER -           03:08 PM

*File Name : ________________________________     Superde Length....:
*Field Name: _______________________________      Superde Format....:

 Contains Repeating Fields:                              C#Derivation Group:
+---------------------------------------------------------------------------
|  1__                               Start End   A/ Fld Sup PE   Dimension
|        Source Field Name           Char  Char  D  Typ Opt Ind  1   2   3
|  ------------------------------ ----- ----- -  --- --- --- --- --- ---
|
|
|
|
|
+---------------------------------------------------------------------------

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                    bkwrd frwrd                    mai
```

Driver for Subprogram CPUSUPER Window
Predict Submenu, Field Information Submenu
Expand Superde or Redefine Option

CPUUNIQ Subprogram

CPUUNIQ	Description
What it does	Determines the unique description field (primary key). This subprogram receives the name of a file and determines the unique description field (primary key) for the file.
PDAs used	CPAUNIQ CSASTD
Files accessed	SYSDIC-FI SYSDIC-EL

CPUVE Subprogram

CPUVE	Description
What it does	Prints verification rules to the source buffer. This subprogram prints either the code or the data definition for a type N (Natural Construct) verification rule to the source buffer.
PDAs used	CPAVE CSASTD
Files accessed	SYSDIC-VE-ACT

Driver Menu Option

```
 CTEVE                   N a t u r a l  C o n s t r u c t            CTEVE1
 Aug 14                    Driver for subprogram CPUVE               1 of 1

 Verification Name: ________________________________ Verification Found:
*User View Name...: ________________________________ Rule Generated....:
*DDM Field Name...: ________________________________

 Generate Data....: _
 Occurrences......: _______________









Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                               mai
```

Driver for Subprogram CPUVE Window
Predict Submenu, Field Information Submenu
Generate Verification Rules Option

CPUVERUL Subprogram

CPUVERUL	Description
What it does	Returns information about Predict verification rules.
Parameters used	CPAVERUL CSASTD
Files accessed	SYSDIC-VE

CPUXPAND Subprogram

CPUXPAND	Description
What it does	Expands a super/subdescriptor or redefined field. This subprogram receives: • the name of a super/subdescriptor (or DB2 compound key) • the name of the Predict file (or table) to which the key belongs • the expansion options • the name of a subprogram to CALLNAT (in CPAXPAND.INPUTS) • the parameters in the model PDA (CU--PDA) • an additional A1/1:v parameter (CSAPASS) It expands the specified super/subdescriptor (or DB2 compound key) into its underlying components. For each component, it CALLNATs the specified subprogram. **Note:** When this subprogram expands a superdescriptor, redefinitions of the derived fields for the superdescriptor are included.

CPUXPAND	Description (continued)
PDAs used	CPAXPAND CU--PDA CSAPASS CSASTD
File accessed	SYSDIC-EL

Driver Menu Option

```
 CTEXPAND            N a t u r a l  C o n s t r u c t           CTEXPN11
 Aug 14               Driver for subprogram CPUXPAND              1 of 3

 *File Name......: _________________________________   Phantom Bytes: _
 *Base Field Name: ________________________________   Fillers......: _
 *CALLNAT........: CTELRDSM     P


  Base Field Information                           Field Headings
  ----------------------                  --------------------------------
  Sequence:       Adabas Field Name:     :
  Format..:       Field Definition :     :
  Length..:       Field Type.......:     :

  Edit Mask......:
  DDM Field Name :


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                      left  right mai
```

Driver for Subprogram CPUXPAND Window 1
Predict Submenu, Field Information Submenu
CALLNAT For Sup/Subde Components Option

```
 CTEXPAND           N a t u r a l  C o n s t r u c t          CTEXPN21
 Aug 14              Driver for subprogram CPUXPAND             2 of 3


Derived Field Information                        Field Headings
------------------------                ---------------------------------
First Showing.:                         :
Field Count...:                         :
Whole Field...:                         :

Sequence......:        Adabas Field Name:      Start Character:
Format........:        Field Definition :      End   Character:
Length........:        Field Type.......:

Edit Mask.....:
Field Name....:
DDM Field Name:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                      left  right mai
Scrolling performed
```

Driver for Subprogram CPUXPAND Window 2
Predict Submenu, Field Information Submenu
CALLNAT For Sup/Subde Components Option

```
 CTEXPAND            N a t u r a l  C o n s t r u c t          CTEXPN31
 Aug 14               Driver for subprogram CPUXPAND              3 of 3

Ascending/Descending
Expanded Field Information                      Field Headings
--------------------------             ---------------------------------
Field  Count..:                          :
Offset Start..:                         :
Offset End....:                         :

Sequence......:        Predict Format...:      Special characteristic:
Format........:        Field Definition :
Length........:

Edit Mask.....:
Field Name....:
DDM Field Name:

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF1
      help  retrn quit                                    left  right mai
Scrolling performed
```

Driver for Subprogram CPUXPAND Window 3
Predict Submenu, Field Information Submenu
CALLNAT For Sup/Subde Components Option

Predict-Related Helproutines (CPH*)

You can attach the following helproutines to fields that require the input of Predict information. They are active helproutines that fill the field to which they are attached.

Note: Some of the following routines provide help information, although they are coded as subprograms and not as helproutines. This provides greater flexibility to access help information.

CPHEL Subprogram

CPHEL	Description
What it does	Browses the fields in a file for selection. This subprogram receives the name of a Predict file. (If no file name is specified, it provides file selection.) It browses all the fields in the specified file and returns the selected field.
Attached to	Input of a Predict field name.
Parameters used	CPAHEL CSASTD
File accessed	SYSDIC-FI

CPHELB Subprogram

CPHELB	Description
What it does	Browses the fields in a file for selection. This subprogram receives the name of a file and browses all the fields in the file for selection. Optionally, this subprogram can browse only the descriptor fields. For more information about the INPUT/OUTPUT parameters for this subprogram, see the CPHELBA data area in the SYSCST library.
PDAs used	CPAHEL CSASTD
File accessed	SYSDIC-EL

CPHFI Helproutine

CPHFI	Description
What it does	Browses Predict views/files for selection. This helproutine browses all the views and files in Predict for selection.
Attached to	Input of a Predict file name.
Parameter used	#PDA-FILE(A32)
Files accessed	SYSDIC-FI

CPHFIB Subprogram

CPHFIB	Description
What it does	Browses Predict views and files for selection.
Parameters used	#PDA-KEY(A32) CSASTD
File accessed	SYSDIC-FI

CPHPRED Helproutine

CPHPRED	Description
What it does	Browses Predict objects (by object type) for selection. This helproutine receives an object type and browses the Predict objects of the specified type for selection. Valid object types are: • S (system) • P (program) • K (keyword) • M (module) • R (report)
Attached to	Input of a Predict object type.
Parameters used	#PDA-TYPE(A1) #PDA-KEY(A32)
Files accessed	SYSDIC-SY SYSDIC-PR SYSDIC-KY SYSDIC-RE SYSDIC-MO

CPHRL Helproutine

CPHRL	Description
What it does	Browses the names of Predict relationships for selection. This helproutine receives the names of a Predict relationship and a file and returns the selected relationship. If a file name is specified, the helproutine browses only the Predict relationships for that file. If no file name is specified, it browses all existing relationships.
Attached to	Input of a Predict relationship name.
Parameters used	#PDA-FILE(A32) #PDA-RELATIONSHIP-NAME(A32)
Files accessed	SYSDIC-FI SYSDIC-RL

CPHSET Helproutine

CPHSET	Description
What it does	Sets a flag to indicate that help was requested for a field. This helproutine receives the name of a parameter and sets a flag to indicate help was requested. The parameter should be checked after the INPUT statement. If a flag is set, for example, reset the flag and issue CALLNATs to do the necessary help processing. This technique allows the helproutine to access all data entered in a single panel transaction. When you generate a browse subprogram, for example, you can type the file name (without pressing Enter) on the Additional Parameters panel and request help for a field.
Attached to	Any input field
Parameter used	#PDA-SET-HELP(L)

CPHSET	Description
Files accessed	SYSDIC-FI SYSDIC-RL

Natural Construct General Purpose Generation Subprograms (CU--*)

The subprograms described in this section are general purpose generation subprograms. These subprograms are identified by a CU-- prefix.

CU--EM Subprogram

CU--EM	Description
What it does	Returns edit masks used by the generated programs for displaying date and time fields. This subprogram can be changed to suit your standards. Changes to this routine should be made in a higher level steplib to minimize maintenance. The date and time field edit masks should not be longer than nine characters unless you modify your models.
Parameters used	CU--EMA

CU--LRP Subprogram

CU--LRP	Description
What it does	Returns the left and right prompt displayed on the Natural Construct panels. The left prompt displays the current month and day in *DATX (EM=LLL"DD), which can be language sensitive. The right prompt displays the "1 of 1" or "1 of 3" panel indicators, depending on the number of panels. This prompt uses several Control record fields to build the prompt position indicators, which are compressed on both sides of the "of" indicator.
Parameters used	#PDA-LEFT-PROMPT(A9) #PDA-LEFT-INDICATOR(A4) #PDA-RIGHT-PROMPT-OF(A4) #PDA-RIGHT-INDICATOR(A4) #PDA-RIGHT-PROMPT(A9) CSASTD

CU--MSG Subprogram

CU--MSG	Description

What it does	Returns the text for an application error message. This generation subprogram is suitable for use in a code frame. It takes a single, literal string parameter and generates source into the source buffer.
	
	This subprogram receives a message number in the #PDA-FRAME-PARM alpha field. After ensuring that this literal is numeric, the subprogram retrieves the short message for the SYSTEM application and the *Language variable. The error message is written (left-justified and enclosed in single quotes) to the source buffer, thus substituting for the frame parameter. The usual search criteria and defaults (English) apply.
	
	The following example shows a typical code frame:
	
	`USE-MSG-NR                                1`
	`ASSIGN MSG-INFO.##MSG-NR = 8123             "`
	`ELSE                                      1`
	`ASSIGN MSG-INFO.##MSG =                      "`
	`SUBPROGRAM:CU--MSG PARAM: 8123            N "`

Parameters used	CU--PDA CSASTD
File accessed	Application error message file.

CU--UL Subprogram

CU--UL	Description
What it does	Returns the underscore line used on the Natural Construct panels. This subprogram receives an underscore character set and creates the underscore line. The underscore character(s) specified on the Control record (an A4 field) is duplicated to fill the A80 length.
Parameters used	#PDA-UNDERSCORE(A4) #PDA-UNDERSCORE-LINE(A80) CSASTD

UTILITIES

This chapter describes the utilities supplied with Natural Construct for all supported platforms.

The following topics are covered:

Introduction

The following sections describe the utilities supplied with Natural Construct for all supported platforms. To invoke a utility, enter its name at the Next prompt (in the Direct Command box for Unix).

Mainframe Note:
When a description refers to "your print file," it refers to Print File 1.

Unix Note:
When a description refers to "your print file," it refers to DEVICE LPT1.

Import and Export Utilities

This section explains how to transfer data across dissimilar platforms (for example, from Unix to mainframe).

Natural Construct's import and export utilities read and write their data from and to work file 1. This is true for each of the following utilities:

Utility	Described in
CSFLOAD CSFUNLD	*Natural Construct Administration and Modeling User's Manual*
CSHLOAD CSHUNLD	*Natural Construct Help Text User's Manual*
CSMLOAD CSMUNLD	*Natural Construct Generation User's Manual*

A work file written on one platform (such as Unix) can be read by another platform (such as mainframe) if the following conditions are met:

- You must be running Natural Construct version 3.3.1 or higher. Only a work file created using this version can be transferred between platforms. The work file must be an ASCII file. For example:

Platform	How to save as an ASCII file
Mainframe	Define work file 1 as a PC file and activate PC Connection before running the utility. (PC Connection translates from EBCDIC to ASCII.)
Unix	Set the work file specification in your NATPARM to any extension other than "SAG".

- When transferring the work file between platforms, select the appropriate translator. For example, the file transfer method you select to move a file from a PC to a Unix machine must translate the PC's CR/LFs to CRs.

Multiple Code Frame Export Utility

The CSFUNLD frame export utility exports selected code frames from the code frame file to work file 1. A report of the exported code frames is written to your print file.

Enter each code frame name one name at a time. As you enter the names, they are automatically displayed on the panel.

For each exported code frame, you can specify whether to export its recursive (nested) code frames — if any exist. To export recursive code frames, mark the Include recursive code frames field. If you do not want to export recursive code frames, leave the field blank.

Examples of input values

Value entered	Results
*	Exports all code frames to work file 1.
MENU X	Exports the "MENU" code frame including any recursive (nested) code frames to work file 1.
FM*	Exports all code frames beginning with "FM" to work file 1.

Enter a period (.) to terminate the input.

Multiple Code Frame Import Utility

The CSFLOAD frame import utility allows you to import selected code frames from work file 1 to the code frame file. A report of the imported code frames is written to your print file.

Enter each code frame name one name at a time. As you enter the names, they are automatically displayed on the panel.

Use the Replace Option field to replace the existing code frames with code frames with the same names in work file 1. To replace the existing code frames, mark the field. If you do not want to replace the existing code frames, leave the field blank.

Examples of input values

Value entered	Results
*	Imports all code frames from work file 1. If a code frame with the same name exists in the code frame file, it is not replaced.
MENU	Imports the “MENU” code frame from work file 1. If the “MENU” code frame exists in the code frame file, it is not replaced.
MENU X	Imports the “MENU” code frame from work file 1. If the “MENU” code frame exists in the code frame file, it is replaced.
FM*	Imports all code frames beginning with “FM” from work file 1. If a code frame with the same name exists in the code frame file, it is not replaced.

Enter a period (.) to terminate the input.

Frame Hardcopy Utility

The CSFHCOPY frame hardcopy utility allows you to print a hardcopy list of your code frames, regardless of your teleprocessing monitor. All output is routed to your print file.

Enter each code frame name one name at a time. As you enter the names, they are automatically displayed on the panel.

Examples of input values

Value entered	Results
*	Routes all code frames to your print file.
MENU	Routes the "MENU" code frame to your print file.
FM*	Routes all code frames beginning with "FM" to your print file.

Enter a period (.) to terminate the input.

Comparison Utilities

The following sections describe utilities you can use to compare two Natural source modules and to compare a range of models in different libraries.

CSGCMPS Utility

This program compares two Natural source modules. You can compare either:

- the contents of two saved modules

  or

- the contents of the module currently in the source buffer to the contents of a saved module

Specify the library ID, module name, database ID, and file number for each module you want to compare. In addition, you can specify the following options:

- ignore comment lines
- ignore trailing comments
- ignore leading spaces
- provide summary only

When you invoke the CSGCMPS utility online, the following window is displayed:

```
                       Compare Criteria
                 Library  Object   Database File or Source Area
                 ======== ======== ======== ====    ===========
Old version ===> CST411M_ CSGCMPS_   017    029          _
New version ===> CST411M_ CSGCMPS_   017    029          _

Options...
   Ignore comment lines...... _
   Ignore trailing comments.. _
   Ignore leading spaces..... _
   Summary only.............. _
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF1
                  quit
```

Compare Criteria Window

CSGCMPL Utility

This program compares a range of modules in one library to the same modules in another library. Specify the library ID, database ID, file number, and range value for the modules you want to compare. In addition, you can specify the following options:

- summary only
- only report if different
- ignore comment lines
- ignore trailing comments
- ignore leading spaces
- only compare object types

Using CSGCMPL Online

When you invoke the CSGCMPL utility online, the following window is displayed:

```
                    Source Range Compare Facility
                                Library  Database File Dominant
                                ======== ======== ==== ========
  Old library............... ________   __17   __29     X
  New Library............... ________   __17   __29     _
  Program range............. ________ thru ________
  Summary only.............. _
  Only report if different.. _
  Ignore comment lines...... _
  Ignore trailing comments.. _
  Ignore leading spaces..... _
  Only compare object types  __________ (ACGHLMNPST)
```

Source Range Compare Facility Window

The Dominant field indicates the range of modules to be compared. Only modules that exist in the dominant library and in the other specified library are included in the compare results. Modules that only exist in the non-dominant library are not included.

The Only compare object types field limits the comparison to modules of a specified object type. Valid object types are:

Object Type	Description
A	Parameter
C	Copycode
G	Global data area
H	Helproutine
L	Local data area
M	Map
N	Subprogram
P	Parameter data area
S	Subroutine
T	Text

Using CSGCMPL in Batch

Batch mode is the most efficient method of comparing many modules. The following SYSIN shows an example of using this utility in batch:

```
LOGON CST421M
CSGCMPL OLD-LIB,001,002,X,NEW-LIB,003,004, ,BEGIN,END,S,D,C,T,L,NPH
FIN
```

where:

`OLD-LIB`	Indicates the name of a library containing modules to be compared.
`001`	Indicates the database ID for `OLD-LIB`.
`002`	Indicates the system file number for `OLD-LIB`.

`X`	Indicates that the `OLD-LIB` is dominant (all modules in the dominant library are compared to any matching modules in the other specified library).
`NEW-LIB`	Indicates the name of a library containing modules to be compared.
`003`	Indicates the database ID for `NEW-LIB`.
`004`	Indicates the system file number for `NEW-LIB`.
`blank`	If blank, indicates that `OLD-LIB` is dominant. If X, indicates that `NEW-LIB` is dominant.
`BEGIN`	Indicates the name of the first module in the range compared.
`END`	Indicates the name of the last module in the range compared.
`S`	Indicates a summary report (does not display detailed differences). This option displays the names of the modules and whether the module contents are the same in both libraries.
`D`	Indicates that only modules that are different are included on the output report. Modules that are identical in both libraries are not included.
`C`	Indicates that Natural comment lines (lines beginning with “*” or “/*”) are not compared.
`T`	Indicates that trailing comments (comments beginning with “/*”) are not compared.
`L`	Indicates that leading spaces are not compared (changes in alignment will not show up as differences).
`NPH`	Indicates the list of Natural object types compared within the specified range of modules.

Upper Case Translation Utility

If you are developing applications in a language that does not support lower case Latin characters, use the supplied CVUPPERC utility to convert the Natural Construct components to upper case. This utility converts all Natural Construct-installed SYSERR message text and source code, as well as the contents of the Natural Construct system file, to upper case. Since this conversion requires a significant amount of processing, only run this utility in a batch environment.

Note: Before running this utility, ensure that the batch job defines the correct Natural Construct logical file, FUSER system file, and FNAT system file.

You can use the following SYSIN to invoke the CVUPPERC utility:

```
LOGON SYSCST
CVUPPERC
FIN
```

After converting the components to upper case, this utility issues a CATALL in the SYSCST library. To reflect the changes in your production environment, manually transfer all modules from the SYSCST library to the SYSLIBS library after the modules have been cataloged.

Additional Utilities

This section describes additional utilities you can use. Each utility is listed in the following table along with a brief description. For more details about any of these utilities, see **Utilities** in *Natural Construct Generation User's Manual*.

Utility	Command	Description
INCLUDE Code Insertion	CSUINCL	Inserts all INCLUDE members into a program. Use this utility to aid in the debugging process by making hidden INCLUDE members display in a program.
JCL Submit (mainframe)	CSUSUB	Submits the contents of the source buffer to the internal reader. This utility requires the availability of the NATRJE module.
Multiple Generation	NCSTBGEN	Regenerates multiple Natural modules using their corresponding Natural Construct models.
Upper Case Translation	CSUPPER	Translates the contents of the source buffer into upper case. Optionally, you can translate any combination of the following elements in the source buffer: comments, statements, or quoted strings.

USING SYSERR REFERENCES FOR MULTILINGUAL SUPPORT

This chapter describes how Natural Construct uses the Natural SYSERR utility to dynamically translate text and messages. SYSERR contains reference numbers that reference text strings in one or more languages.

The following topics are covered:

Introduction

Natural Construct supports the dynamic translation of text and messages on many model specification panels. Instead of typing text for panel headings, field prompts, error messages, etc. You can use a SYSERR reference number. At runtime, the reference number is replaced with its corresponding SYSERR text.

Maintenance

Using SYSERR references reduces your maintenance efforts. To modify a field prompt used on many panels, for example, you can change the text in SYSERR and all fields that use that number display the new name at runtime. It also helps maintain consistency throughout your generated applications, by ensuring that the same text is displayed in multiple locations.

Translation

For each SYSERR reference number, you can define message text in other languages. At runtime, text for the currently-selected language (the current value of the *Language system variable) is retrieved.

The text on all Natural Construct panels can be dynamically translated into any Natural-supported language.

Note: If you only require one language, this feature can be disabled during installation. For more information, see **One Language (Static) Mode**, page 514.

The default language for Natural Construct is English (*Language 1), which is always supported. Check with your local Software AG office to ensure that your language is supported.

Defining SYSERR References

Each SYSERR reference number can have up to 15 distinct text entries — each one separated by a (/) slash delimiter. For information about setting up reference numbers, see **SYSERR Utility** in the *Natural Utilities Manual*.

To use SYSERR reference numbers in Natural Construct, the reference must follow a pattern where the first character is an * (asterisk) and the next four digits represent a valid SYSERR reference number. For example:

```
*NNNN
```

where * indicates the currently specified SYSERR message library and *NNNN* represents a valid reference number.

To identify one of the 15 possible positions within a SYSERR reference number, use the following notation:

```
*NNNN.A
```

where *A* is a number from 1–9 or a letter from A–F. The numbers 1–9 represent the first nine positions and the letters A–F represent the 10th to 15th positions. For example, to reference the fifteenth position within a reference number, specify:

```
*NNNN.F
```

Note: We recommend that you always specify a position value, even if there is only one occupied position in the reference number. This eliminates the need to modify SYSERR references if additional positions are occupied in the future.

Using SYSERR References

You can use SYSERR reference numbers in several ways, such as:

- on maps (screen prompts)
- for panel headings and PF-key names
- in messages
- for text translation
- with substitution values

All text members, excluding the help text members, reside within the SYSERR utility. Each text member is identified by a two-part key — a SYSERR library name and a four-digit number.

For more information about SYSERR, see the Natural SYSERR utility documentation. For information about using SYSERR references for help text, see the **Using Message Numbers**, page 32, in *Natural Construct Help Text User's Manual*.

On Maps (Screen Prompts)

To display panels in many languages, Natural Construct uses a single map approach. Variables for all screen prompts are defined and initialized in a translation local data area (LDA) associated with each map.

Translation LDAs initialize the screen prompts with SYSERR references for the dynamic translation version or constants for the static version. All supplied LDAs use SYSERR references by default, but you can change this if desired. For more information about dynamic and static installations, see *Natural Construct Installation and Operations Manual for Mainframes*.

The one-to-one association between a map and its translation LDA is an effective method for naming and tracking panels and their prompts. Each supplied map and its translation LDA have identical names — except for the last character. The last character in a map name is "0" (zero) and the last character in a translation LDA name is "L". For example, the second specification panel for the Menu model is CUMNMB0 and the translation LDA is CUMNMBl.

Screen prompts are typically translated prior to displaying a panel, and panels usually have more than one prompt. For this reason, Natural Construct uses the CSUTRANS utility to receive a block of text and translate all references numbers. The CSTLDA library in SYSERR is Natural Construct's dedicated library and contains all language-independent prompt text.

For more information, see **CSUTRANS Utility**, page 507.

For Panel Headings and PF-Key Names

Note: When we refer to panel headings and PF-key names, we are referring to the Natural Construct panels and PF-keys and not those used by the generated applications.

You define and maintain panel headings and PF-key names in the Administration subsystem: the first heading for a model specification panel on the Maintain Models panel and the PF-key settings on the Natural Construct Control record.

If desired, you can use the CST-Modify model to generate a model modify subprogram to override these defaults. Modify subprograms reference the #HEADER1 and #HEADER2 internal variables to display panel headings. If these headings are not overridden by the model modify subprograms, Natural Construct automatically uses the defaults supplied by the nucleus (in the CU—PDA.#HEADER1 and CU—PDA.#HEADER2 variables). For more information about overriding panel headings, see **Standard Parameters Panel**, page 233.

All Natural Construct panel headings and PF-key names support text or SYSERR references (the *NNNN.A notations). For example, to name a PF-key "main" on the Control record, enter one of the following:

- "*0033.5" (which corresponds to "main" in SYSERR)
- "main" (which disables the dynamic translation feature)

All heading and PF-key text is saved in the same SYSERR library as the prompt text (CSTLDA).

In Messages

All Natural Construct messages also support dynamic translation. Messages have action properties (verbs), whereas screen prompts have descriptive properties (adjectives). For this reason, the message and prompt text is stored in separate SYSERR libraries and use separate translation utilities:

- Messages are stored and maintained in the CSTMSG library and are accessed via the CNUMSG single message utility.
- Screen prompts are stored and maintained in the CSTLDA library and are accessed via the CSUTRANS utility.

If you change the supplied screen prompt text, ensure that the screen prompt and message text are consistent. If the message text references a different SYSERR number than the screen prompt, the message may be confusing.

With modules for which source is not supplied, Natural Construct uses the text substitution feature supported by the CNUMSG utility (where :1::2::3: are place holders for potential substitution values). For example, if the screen prompt is "Module" and the message is ":1::2::3:is required", the message is displayed as: "Module is required."

This message substitution feature provides many benefits, including:

- consistent use of panel and message text
- reuse of common messages, such as "is required"
- reduced volume of message translation
- consistent wording between modules
- support for a cleaner and crisper look

The following example shows a typical message and how it is coded:

```
ASSIGN CNAMSG.MSG-DATA(1) = CU—MAL.#GEN-PROGRAM
INCLUDE CU—RMSG '2001'
        ''':1::2::3:is required'''
        '#PDA-PROGRAM-NAME'
```

This assignment transfers the contents of the corresponding prompt variable into the first (of a possible three) substitution data member: CNAMSG.MSG-DATA(1). The members are then transferred into an INCLUDE member that calls the CNUMSG utility.

In the preceding code example, CU—MAL is the translation LDA for the CU—MA0 map and CU—MAL. #GEN-PROGRAM is the prompt variable containing the initialized text (either “Module” or the SYSERR number that references “Module”). The 2001 on the INCLUDE line represents the SYSERR reference number that points to the message: “:1::2::3:is required”. The “:1::2::3:is required” text below the INCLUDE code is used as an internal default should the text not be found.

You can use the Natural Construct messaging infrastructure to override the message lookup and force the CNUMSG utility to disregard the SYSERR reference number and use the text (:1::2::3:is required) instead. This feature is useful during model development because you can enter message text in the source code or test the code without calling the SYSERR utility. To do this for a single module, add a single line before the previous code example as follows:

```
ASSIGN CNAMSG.INSTALL-LANGUAGE = *LANGUAGE
```

To do this for an application, change the initial value for the CNAMSG.INSTALL-LANGUAGE variable and recompile all the Natural Construct model subprograms.

The following INCLUDE code members all retrieve message text, but process the text in different ways:

INCLUDE Code Member	Description
INCLUDE CU—RMSG	Retrieves and displays messages on current panel.
INCLUDE CU—SERR	Retrieves and sets error code messages and then exits current module.
INCLUDE CU—GMSG	Retrieves messages and continues processing (typically used for warning messages).
INCLUDE CU—GTXT	Retrieves messages and continues processing, but does not transfer the text to the CSASTD structure (typically used to perform initializations without corrupting the messaging data in CSASTD).

For Text Translation

You can translate text in one of two ways: mass translation from within the SYSERR utility or context translation from within Natural Construct, which uses the SYSERR utility to store text for all supported *Language values. English is the default language; it is always supplied and supported.

Since translation is typically performed once shortly after installation (or not at all if the product is delivered with the text translated), Natural Construct provides a special translation mode that is invoked via a command you can secure. This command, MENUT, invokes the Administration subsystem in translation mode with all translatable prompts and headings highlighted for easy identification.

Mass Translation

All Natural Construct text is available in SYSERR. The combination of the SYSERR library name and a four-digit number is the unique key or pointer to a particular text member. For example, the ":1::2::3:is required" message is stored in the CSTMSG library and its four-digit number is 2001; the "Module" screen prompt is stored in the CSTLDA library and its four-digit number is 1000.

Within SYSERR, you can translate many messages one after the other (mass translation). This mechanism is fine for messages where the context is not critical. For example, the ":1::2::3:is required" message is universal and used frequently by all types of modules.

Screen prompts are more context sensitive; they may belong in a particular group or depend on a heading for meaning. To translate screen prompts, it is a good idea to perform a mass translation first and then check each panel individually for context. This is the most efficient way to translate a large number of text members, as the mass translation can be accomplished by less experienced Natural Construct users or a translation service.

Context Translation

Natural Construct's context (cursor-sensitive) translation provides a simple but effective method to check or change the results of a mass translation. It allows you to display a panel, place your cursor on highlighted text, press Enter, and be presented with a window in which you can change or translate the text:

```
CSUTLATE                    Natural Construct
Jul 04                   Translate Short Message                    1 of 1

Language Short Message ( CSTLDA2101 )
──── ....+....1....+....2....+....3....+....4....+....5....+....6....+

English  Module/Model/Maps                                            /+20
```

Translate Short Message Window

This feature is even more convenient on a PC using Entire Connection, in which case you can double-click any prompt to perform the translation.

Note: You can also use the context translation mechanism to perform the original translation (instead of mass translation).

Note: Because messages are displayed one at a time, they do not require context translation.

Since translation is typically performed once shortly after installation (or not at all if the product is delivered with the text translated), Natural Construct provides a translation mode command that you can secure. This command, MENUT, invokes the Administration subsystem in translation mode with all translatable prompts and headings highlighted for easy identification.

Unlike messages, which all use the same byte length, screen prompts vary in length depending on panel design and available space. For performance and space considerations, multiple screen prompts may share the same SYSERR location. For example, SYSERR number 2000 corresponds to the following text:

```
CSTLDA2000 Module/System/Global data area                         /+20
```

CSTLDA2000 indicates the SYSERR library and the four-digit number that identifies the values: Module, System, and Global data area (delimited by a "/"). Decimal numbers indicate which text is retrieved (2000.1 for Module, 2000.2 for System, and 2000.3 for Global data area). Since prompts can be different lengths, the /+20 notation indicates that each of these prompts can occupy up to 20 bytes on any panel they are used.

With Substitution Values

Substitution values are additional data that can be displayed with message text at runtime. For example, you can specify that Menu (the substitution value) be displayed with Main (the message text). The actual substitution value can be either text or another reference number. Most areas in Natural Construct that support reference numbers also support data substitution. (For information about supported areas, see **Supported Areas in Natural Construct**, page 505.)

To use substitution values with a reference number, the reference number must be defined in the SYSERR utility with the :1::2::3: place holders. For more information, see **Statements — REINPUT** in the *Natural Reference Manual*.

To specify substitution values for a reference number that contains place holders, type the reference number (*NNNN.A format), followed by a comma (,) delimiter, and up to three substitution values. For example, if you enter:

```
0200.1,Menu,Model
```

where `0200.1` corresponds to the message text, :1::2::3:Program, and `Menu` and `Model` are the substitution values.

At runtime, the following text is displayed:

```
Menu Model Program
```

In this example, `Menu` replaced the first place holder and `Model` replaced the second.

Note: If no substitution values are defined, the place holders are ignored.

You can enter text, or reference numbers, or both as substitution values. For example, if you enter:

```
0200.1,Menu,0502.4
```

where `Menu` is the first substitution value and `0502.4` is the second substitution value (which corresponds to the message text, “Model”)

At runtime, the following message is displayed:

```
Menu Model Program
```

Formatting SYSERR Message Text

In some areas where SYSERR references can be used, you can specify how the retrieved message text is formatted at runtime. The following table describes the available formatting characters:

Character	Description
,	Separates the *NNNN.A notation from the format characters.
.	Fills the remaining blanks with periods.
+	Centers the retrieved text.
<	Left-justifies the retrieved text. Typically, you will not use this character because retrieved text is left-justified by default.
>	Right-justifies the retrieved text.

Character	Description (continued)
/	Indicates the end of format characters and the beginning of the field length override. For example, "+/30" indicates that the first 30 characters of returned text are centered. Any additional characters are truncated. This character is used with alignment characters (such as +, <, or >).
NN	Indicates the field length override value. Using the example above (+/30), the field length override is 30 characters.

The following examples show different methods of formatting the text for SYSERR reference number 0210.1 (which references the text, "Field Help"):

<table>
<tr><th>Format Specified</th><th>Result</th></tr>
<tr><td>*0210.1,+/24</td><td>Centers text in 24 bytes. At runtime, text is displayed as:
| Field Help |</td></tr>
<tr><td>*0210.1,>/24</td><td>Right-justifies text. At runtime, text is displayed as:
| Field Help|</td></tr>
<tr><td>*0210.1,/24 or
*0210.1,</24</td><td>Left-justifies text (the default). At runtime, text is displayed as:
|Field Help |</td></tr>
<tr><td>*0210.1,./24</td><td>Left-justifies text and fills the remaining blank spaces with periods. At runtime, text is displayed as:
|Field Help................................. |</td></tr>
</table>

Supported Areas in Natural Construct

The following table lists the areas where you can use SYSERR references. The Substitutions column indicates whether substitution values are supported for the corresponding panel and the Formatting column indicates whether formatting is supported. For information about substitution values, see **With Substitution Values**, page 502. For information about formatting, see **Formatting SYSERR Message Text**, page 503.

Location	Substitutions?	Formatting?
Maintain Control Record panel:		
• PF-key names	No	No
• Indicators	No	No
Maintain Models panel:		
• Description	Yes	No
Maintain Subprogram panel:		
• Description	Yes	No
• PF-key names	No	No
CST-Modify Standard Parameters panel:		
• Header 1	Yes	Text centering only
• Header 2	Yes	Text centering only
• PF-key names	No	No
Translation local data areas (LDAs):		
• CNUMSG utility	Yes	Partial support
• CSUTRANS utility	Yes	Yes
Help Text editor:		
• Header 1	Yes	No
• Header 2	Yes	No
• Hotlinks	Yes	No
• Body of help text	Yes	Yes

The following table lists the chapters where you can find more information about each of the Natural Construct functions and utilities in which SYSERR reference numbers are supported:

To Learn More About	See
Maintain Control Record panel	**Maintain Control Record Function**, page 62
Maintain Models panel	**Maintain Models Function**, page 48
Maintain Subprogram panel	**Maintain Subprograms Function**, page 61
CST-Modify Standard Parameters panel	**Parameters for the CST-Modify Model**, page 240
Translation LDA utilities (CNUMSG and CSUTRANS)	**CNUMSG Subprogram**, page 366, **CNUMSG Utility**, page 511, **CSUTRANS Subprogram**, page 435, **CSUTRANS Utility**, page 507
Help Text editor	**Help Text Editor**, page 63, *Natural Construct Help Text User's Manual*

CSUTRANS Utility

Natural Construct translates screen prompts before they are displayed. As most panels have multiple prompts, Natural Construct incorporates the CSUTRANS utility to receive a block of text and translate all references to SYSERR numbers into the appropriate *Language text.

CSUTRANS translates 1:V data structures and is used extensively for dynamic translation. The utility reads through a supplied local data area, looking for one of two patterns: *NNNN or *NNNN.A.

The *NNNN pattern returns all text for that SYSERR number, whereas the *NNNN.A pattern returns only the text in the specified position (delimited by a /, such as *NNNN.1 for the first position, *NNNN.2 for the second, *NNNN.A for the 10th, etc.). The extension in the *NNNN.A pattern is alphanumeric; valid values range from 1–9 and A–F, for a total of 15 possible positions.

To retrieve a valid message, you must also specify the SYSERR library name (CSTLDA, by default). To change the library name, use the #MESSAGE-LIBRARY variable.

You can also use SYSERR numbers to assign the INIT values for fields in the translation LDAs. These LDAs are passed through the CSUTRANS utility, which expects a certain data structure. The example on the following page illustrates this structure for the Standard Parameters panel for the Batch model:

```
***SAG TRANSLATION LDA
***used by map CUBAMA0.
   1 CUBAMAL
   2 TEXT                              /* Corresponds to SYSERR message
   3 #GEN-PROGRAM             A   20 INIT<'*2000.1,.'>
   3 #SYSTEM                  A   20 INIT<'*2000.3,.'>
   3 #GDA                     A   20 INIT<'*2000.2,.'>
   3 #TITLE                   A   20 INIT<'*2001.3,.'>
   3 #DESCRIPTION             A   20 INIT<'*2001.2,.'>
   3 #GDA-BLOCK               A   20 INIT<'*2001.1,.'>
 R 2 TEXT
   3 TRANSLATION-TEXT
   4 TEXT-ARRAY               A    1 (1:120)
   2 ADDITIONAL-PARMS
   3 #MESSAGE-LIBRARY         A    8 INIT<'CSTLDA'>
   3 #LDA-NAME                A    8 INIT<'CUBAMAL'>
   3 #TEXT-REQUIRED           L      INIT<TRUE>
   3 #LENGTH-OVERRIDE         I    4 /* Explicit length to translate
```

Some of the important structural elements in this LDA are:

- The first comment line (**SAG TRANSLATION LDA) indicates that this is a translation LDA. During a Static install, Natural Construct scans for this comment line and replaces the SYSERR numbers with the appropriate text
- The CUBAMAL level 1 structure name is typically the LDA name. You should use this qualifier to reference the variables
- The level 3 variables (#GEN-PROGRAM, #SYSTEM, #GDA-BLOCK, etc.) are the screen prompts, which are initialized with a SYSERR number. All SYSERR numbers use the *NNNN.A notation and are listed in sequential order (so that CSUTRANS does not retrieve SYSERR *2000, then *2001, and then *2000 again).

Note: The sequence order does not apply to the *NNNN.A notation extensions (.A). For example, you can list *2000.2 before *2001.1.

- The TEXT-ARRAY value must match the total number of bytes in all screen prompt variables to be translated
- The #MESSAGE-LIBRARY value indicates the SYSERR library name used to retrieve text
- The #TEXT-REQUIRED logical variable indicates whether translation is required for Natural Construct modules. If translation is required, #TEXT-REQUIRED ensures that translation is only performed once.

The SYSERR INIT values have the following format:

Position	Format
Byte 1	Must be an asterisk (*).
Bytes 2–5	Must be numeric and represent a valid SYSERR number. The first five bytes are mandatory. These values are used to retrieve the text associated with the corresponding SYSERR number and the current value of *Language. If the text for the current language is not available, CSUTRANS follows a modifiable hierarchy of *Language values until text is retrieved (you define this hierarchy in the DEFAULT-LANGUAGE field within the CNAMSG local data area). As the original development language, English (*Language 1) should always be available. **Note:** CSUTRANS does not perform substitutions (using :1::2::3:). To perform substitutions, call the CNUMSG subprogram.
Byte 6	Can be a period (.), which indicates that the next byte is a position value.
Byte 7	Can be a position value. Valid values are 1–9, A (byte 10), B (byte 11), C (byte 12), D (byte 13), E (byte 14), F (byte 15), and G (byte 16). For example, *2000.2 identifies the text for SYSERR number 2000, position 2 (as delimited by a / in SYSERR). If the message for SYSERR number 2000 is Module/System/Global data area, only System is retrieved. If you reference the same SYSERR number more than once in a translation LDA, define the INIT values on consecutive lines to reduce the number of calls to SYSERR. The position values for a SYSERR number can be referenced in any order. **Note:** To minimize confusion, we recommend that you use the .A extension even when there is only one position defined for the SYSERR number.

Position	Format (continued)
Byte 8	Can be a comma (,), which indicates that the next byte or bytes contain special format characters. Values specified before the comma (,) indicate what text to retrieve; values specified after the comma indicate how the text is displayed.
Note:	Although you can use a comma in byte 6 (instead of a period), use the .A extension in bytes 6 and 7.
Byte 9	After the comma, can be one of the following:
. (period)	Indicates that the first position after the field name is blank and the remainder of the field prompt is filled with periods (Module ....:, for example).
+	Indicates that the text is centered using the specified field length override (see description of Byte 10). If you do not specify the override length, Natural Construct uses the actual field length.
<	Indicates that the text is left-justified (this is the default).
>	Indicates that the text is right-justified.
/	Indicates that a length override value follows. This character is placed after the alignment character (+,< or >)
Bytes 10–16	After the / override length indicator (see above), indicates the actual override length in bytes.

If you want to use the override length notation (*0200.4,+/6, for example) and the LDA field is too small (A6, for example), define a larger field, redefine it using a shorter display value, and then use the override length notation. For example:

```
01  #FIELD-NAME                     A 12 INIT<'*0200.4+/6'>
01  Redefine #FIELD-NAME
  02  #SHORT-FIELD-NAME             A  6
```

CNUMSG Utility

Unlike CSUTRANS, the CNUMSG utility only retrieves text for one message at a time. It is typically used to retrieve warning or error messages, and sometimes to retrieve text for initialization.

The CNUMSG utility retrieves message text in one of two ways. If a reference number is specified (CNAMSG.MSG-NR), CNUMSG uses that number to retrieve the SYSERR message text. If a reference number is not specified, CNUMSG checks the message text (CNAMSG.MSG) for the *NNNN or *NNNN.A notation and uses the specified notation to retrieve the SYSERR message text.

CNUMSG can also substitute values in the text it retrieves (up to a maximum of three substitution values). CNUMSG retrieves the message from SYSERR and checks to see if the message has any substitution place holders. If it does, then the substitution text data members (CNAMSG.MSG-DATA(*)) are substituted into the appropriate place holder. If the data member is another SYSERR reference, it is retrieved and substituted. All unused substitution place holders are removed. By default, CNUMSG uses the CSTMSG SYSERR library for messages and the CSTLDA SYSERR library for substitution data fields.

Examples of using the CNUMSG utility

For the following examples, assume you want to create the message: “ADD Action Description is required” and the available SYSERR numbers and text are:

SYSERR Number	SYSERR Library	SYSERR Text
*2001	CSTMSG	:1::2::3:is required
*1116.1	CSTLDA	Action/Subprogram
*1117.1	CSTLDA	Description

Example 1: Typical text retrieval

```
ASSIGN #DESCRIPTION ="*1117.1"...         /* Variable with a SYSERR
reference
ASSIGN CNAMSG.MSG-DATA(1) = "ADD"  ..   ../* Hardcoded text
ASSIGN CNAMSG.MSG-DATA(2) = "*1116.1"     /* SYSERR Reference
ASSIGN CNAMSG.MSG-DATA(3) = #DESCRIPTION  /* Variable reference
INCLUDE CU—GMSG "2001"
       """:1::2::3:is required"
       """ """
```

Example 2: Text retrieval using a comma as the delimiter

```
ASSIGN CNAMSG.MSG = "*2001,ADD,*1116.1,*1117.1"
INCLUDE CU—GMSG " "
       """:1::2::3:is required"
       """ """
```

Both of these examples build the same message. Example 1 is the preferred method because it is much more explicit. The method in Example 2 is useful when only the message text is available and the input must be entered in one field, such as the description, header, or title fields.

Note: Example 2 also supports centering. If you specify +/NN in your message text, CNUMSG uses the NN value as the centering length and removes the remainder of the text (the ,+/NN pattern).

To perform a desired function, CNUMSG can also be called with a method. Natural Construct supports the following methods:

Method	Description
R	Retrieve the SYSERR message as is without any text substitution. This method is good for cases where substitutions are not desirable and the :1::2::3: place holders should be left intact (for example, when generating a call to CNUMSG itself).
S	Substitute the data into the :1::2::3: place holders without retrieving the main message text. For example, you may have a text string created programmatically to which you want to apply substitutions. This method only substitutes the available (passed) data into the place holders. Unused place holders are removed.
B	Retrieve the message text and perform the substitutions. This is the most commonly-used method and is the default setting when the method is blank.
blank	If the method is blank, the default is B.

All other method settings will return a fatal error without performing any actions.

One Language (Static) Mode

If you intend to operate Natural Construct in one language only and do not require dynamic translation, you can replace all SYSERR references with text when Natural Construct is installed. During installation, Natural Construct provides a Static option that retrieves and replaces the *NNNN references with the appropriate *Language text. (Before using the Static option, check with your local Software AG office to ensure that your language is supported. English is always supported.)

The Static option does not replace every SYSERR reference with text; it only replaces SYSERR references in the most frequently used modules. The following table describes the areas affected and the replacements made:

Area	**Replacements**
Screen prompts	In all translation LDAs for which source is supplied (CU prefix), the Static option replaces references with text. (To identify a translation LDA, Natural Construct checks the first comment line for **SAG TRANSLATION LDA.)
Translation LDAs	For the most frequently used translation LDAs for which source is not supplied, you can generate subprograms and static text LDAs (for information, see *Natural Construct Installation and Operations Manual for Mainframes*).
Headings and PF-key names	For all panel headings and PF-key names (which are installed with SYSERR references), you have the option of replacing the references with text.
Messages	Dynamically translated at runtime (since messages are only displayed during an error or warning condition).
Help text	Dynamically displayed at runtime (displayed on request).

Natural Construct can also use the English text supplied with each INCLUDE code member and bypass the SYSERR retrieval process (see **In Messages**, page 498).

APPENDIX — GLOSSARY OF TERMS

The following terms are used throughout this manual:

Term	Definition
Browse program	Program that retrieves records from a specified file and allows users to select a record for processing. Sometimes referred to as a query program.
Browse a file	View the records in a specified file.
Code frame	Block of code that performs a specified function. A code frame is the basic element of a model; it is a skeleton outline of the code generated by the model.
Constant	Value that is always the same.
Copycode	Static code that is provided for you to copy and use in INCLUDE statements.
Cursor-sensitive or Cursor sensitivity	Created by moving the cursor at an item and pressing Enter. If you are using PC Connection to access Natural Construct, you can double-click with the mouse to select.
Data area	Natural module in which data is stored. For example, a parameter data area stores parameters that are passed between subprograms, and a global data area stores data that is used by all programs in an application.
Enter	Type a value in a field and press Enter (or Return).
Execute	Start or display a program, menu, panel, editor, utility, etc. Also referred to as “invoke”.

Term	Definition (continued)
Field	Area in a window or on a panel that either displays information or requires the user to add information.
Function	Menu option, for example, the Maintain Models function on the Administration main menu.
Helproutine	Natural module that displays a help panel.
Invoke	See "Execute".
Mark a field	Type any non-blank character in the field.
Note:	*You may also be required to press the Enter key.*
Model	Natural Construct template used to record specifications and generate source code into a Natural buffer.
Module	Any object that is generated by Natural Construct.
Object	Any entity that represents a business function and is used by Natural Construct.
Optional field	Field for which information is optional rather than required.
Panel	Screen or map on which parameters may be specified.
Parameter	Value for a field.
PF-key	Program function key. To perform the associated function, press that key. For example, pressing PF1 (help) displays help information.
Program	Block of code that performs a function, for example, a subprogram, subroutine, helproutine, etc. Also referred to as a module.
Query program	See "Browse program".
Required field	Field for which input is required.

Term	Definition (continued)
Return code	Code you enter on a menu to return to the previous panel. The return code on Natural Construct menus is a period (.)
Scroll	Move forward (down), backward (up), left, or right through the information displayed on a panel or in a window.
Specify	Supply a value for an input field, for example, by typing a value in the field and pressing the Enter key or by marking the field.
Subprogram	Self-contained block of code that is called via parameters by a program to perform a function.
Subroutine	Block of code (within a larger block of code) that is referenced one or more times. A subroutine is typically used to perform repetitive tasks or to isolate a specific task.
Substitution parameters	Parameters that always have the same format and different values at generation time.
Terminate	End your Natural Construct session.
User exit	Area in the program code that is reserved for user-defined functions. In these areas, users can change the generated functions for their own requirements. User exit code is preserved when the program is regenerated.
Utility	Program supplied to perform a specific function, for example, the model load utility.
Variable	Value that represents one of many possible values. The actual value can be supplied by Natural when the program is executed or supplied by other variables (either user-supplied or derived).
Window	Separate, self-contained area displayed on a panel (for example, a help window).

INDEX

Symbols

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y